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JOURNAL OF GENETIC PSYCHOLOGY

Child Behavior, Animal Behavior, and Comparative Psychology

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EDITED BY

Carl Murchison

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The Journal of Genetic Psychology, 1946, **69**, 3-44.

A COMPARATIVE STUDY OF THE BEHAVIORAL DEVELOPMENT OF NEGRO INFANTS*

Clinic of Child Development, School of Medicine, Yale University

BENJAMIN PASAMANICK, M.D.[1]

A. INTRODUCTION

During the twentieth century and with the advent of more precise quantitative methods in the life sciences, there have appeared numerous studies on the Negro. Most of them have arisen as a by-product of the age-old concept of race superiority and inferiority. Particularly in the field of psychometrics a tremendous mass of material has accumulated. Otto Klineberg, in a comprehensive monograph on the subject of tests of Negro intelligence, thus states the problem of interpretation of such material (18):

> . . . extended discussion of the factors which enter into the interpretation of Negro-white comparisons in test scores has indicated some of the difficulties inherent in this whole problem. It is of course not being suggested that all these factors enter into any single study, but all of them do play a part in "racial" comparisons in general. Together they represent what seem at the present time to be insurmountable difficulties in the way of an objective, scientifically acceptable methodology in this field. The complications which they introduce must lead to the conclusion that racial differences have not been demonstrated by means of intelligence tests, since so many non-racial factors enter into the results. The tests have, however, revealed a number of differences between the groups, which it is important to keep in mind in connection with any survey of the present status of the Negro. In

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*A follow-up study on 44 of the 53 infants, ranging in age from 19 to 32 months, has just been completed, and a further report on the findings will be forthcoming.

[1] The writer is deeply grateful to Miss Elizabeth Fox, director; Miss Irma Reeves, assistant director; the Misses Frances Porter and Julia Honeywell, general supervisors; Mrs. Jane White and the Misses Armentry Hullum and Olive Ballard, staff nurses, of the New Haven Visiting Nurse Association, without whose aid this study would not have been possible. They gave unstintingly of their time and effort, visiting each child at least once, and often a number of times. The fact that such a large proportion of the available subjects were examined bears witness to the thoroughness of their work.

He is indebted to Mr. Paul Hartmann, technician of the Clinic of Child Development, for the execution of the graphs in this report.

The author wishes to tender his warmest thanks to his wife, Dr. Hilda Knobloch, for her invaluable assistance in this study from the inception of the investigation through the completion of its final written draft.

To Dr. Arnold Gesell and Dr. Catherine S. Amatruda the writer is obligated for much more than aid and advice in this study. He owes to them a scientific philosophy of development which has permeated all his thinking.

> terms of achievement of the type measured by the tests, we must state that the Negro is on the average inferior; in terms of aptitude or innate capacity, no such statement can be made. It is doubtful whether the mental testing technique will ever lend itself to any comparison of native differences independent of the background factors involved.

As recently as 1945 a polemic on this subject arose in the pages of *Science* (20). In an eloquent plea for "The Importance of Coöperative Studies of the Biology of Man" Dice (13) inadvertently began a controversy that ran through two volumes of *Science* by mentioning "race," "environment," and "heredity" without defining them. What was being attacked became clear when his critics brought the "Intelligence of the Negro" into the controversy. In the very laudable attempt to keep the concept of race supremacy from fouling science and society, the participants in this discussion were constantly on the alert for any statement which might be considered to any degree "racially" biased.

In the process of defending ourselves from an ideology which helped to light the last world conflagration and unfortunately is still all too prevalent in our country, we tend to forget that the environmental factors which are claimed to produce the poor showing of Negroes on the various tests of intelligence are still in operation, continue to exert their force and must of necessity appear as inadequacy in the Negro. Too frequently the impression is given that the tests are invalid or are administered and interpreted in a prejudiced fashion. No doubt this is sometimes true. Looking upon it as unemotionally as possible, however, we are forced to accept Klineberg's statements (19).

> The real test of Negro-white equality as far as intelligence tests are concerned can be met only by a study in a region in which Negroes suffer no discrimination whatsoever and enjoy exactly the same educational and economic opportunities. . . . It is safe to say that as the environment of the Negro approximates more and more closely that of the White, his inferiority tends to disappear.

Otherwise the melioristic attitude towards society and its inequalities loses its cogency.

The writer does not intend to become embroiled in this quarrel. In studies where adequate control of variables is either exceedingly difficult or not forthcoming, scientific evaluation is equally formidable.

In 1931 McGraw (21), in "an attempt to avoid the usual objections and pitfalls which are usually associated with studies of racial differences—language, environmental conditions, age, educational differences, etc.," compared the development of Negro and white *infants*. She quotes Gesell "The growth characteristic of the infant must therefore prefigure in some ascertainable manner the growth characteristics of maturer years and even behavior traits of those years." And further, quoting Bühler and Hetzer ". . . in so far as pathological backwardness is a matter of very low learning ability, we were able to observe it as early as the middle of the first year." She then says "In the light of these tenets, a racial study based upon the reactions of *infants* offers a new aspect to the problem of Negro-white differences."

She used the "Baby-Tests," devised and standardized by Hetzer and Wolf under the direction of Charlotte Bühler. These were administered to 68 white and 60 Negro babies, two to eleven months old, approximately 50 per cent of the babies born during that year in each group in Tallahassee, Florida. Her findings are summarized by the statement (21) "In general, the developmental level achieved by the Negro babies appears to be about 80 per cent as mature as that of the white babies." She concludes that "The data of this experiment corroborate the findings of previous investigations on older subjects evincing a 'slight but consistent superiority' of the white subjects over the Negroes.

"It is significant that even with very young subjects when environmental factors are minimized. the same type and approximately the same degree of superiority is evidenced on the part of the white subjects as that found among older groups."

Brown (7) and Klineberg (18), in commenting on McGraw's work, draw attention to the differences in height and weight between the white and Negro infants studied. Klineberg states "The important problem in this study is that of the comparability of the two groups studied. The investigator does point out that the colored babies, both boys and girls, fall noticeably below their norms in weight, and that the divergence from the standard increases with age. There might be a nutritional factor modifying the performance of the Negro babies, particularly the older ones. . . ." He further states (18) "Environmental factors, in this case specifically the factor of more adequate nourishment, would undoubtedly enter to some degree, and the investigator gives sufficient evidence of the marked economic inferiority of the Negro group tested. In addition it seems highly probable that indirect factors, such as stimulation of the child by the parents, adequate handling of the child's needs, play of a stimulating character, etc., might all enter to a significant degree even at this early age."

One other developmental study of Negro infants was found in the literature. In 1927 (12), during an anthropological study of "Race Crossing in Jamaica," the Gesell schedules as described in "Mental Growth of the Preschool Child" (1925) were applied to 23 colored infants, from 12 to 13 months of age, living in a creche. In the original published report the findings were examined by Gesell who ". . . concluded that the motor and language performance of the Jamaica babies was similar to that of New Haven babies, but that they were inferior to the latter in adaptive capacities requiring memory and insight, and in bowel and bladder control." The conclusions pertinent to the study were:

> The average performance of the Negroes was inferior to that of New Haven whites upon whom the tests were standardized, but this fact did not constitute reliable evidence of intellectual inferiority because of certain extrinsic factors. These were: low economic status, poor physical condition, radical differences in culture, and, perhaps, subtle emotional attitudes which would elude statistical treatment. The Jamaica children were strikingly inferior in height and weight to American white children but were precocious in gross motor behavior (10).

An additional factor which was not mentioned, but which the writer will attempt to correlate later in his own study, is the fact that the babies spent most of their waking hours in the creche and probably lacked the individual care needed in the early developmental period.

Another controversial subject the writer is determined to avoid as confusing and not pertinent to the problem in hand is that of the concept of "race," including the amount of white admixture in the American Negro people, and its effect on Negro characteristics. There exists wide variation of opinion in this matter. There is no doubt, however, that for a number of reasons the Negro constitutes a more or less distinct national group on the American scene. As such he has been studied and compared to white groups, chiefly to his detriment. It is in the sense of such a distinct national group that the writer has selected a number of Negro infants and compared them to white babies as a basis for the present study.

A final introductory comment should be made concerning the ultimate diagnostic and prognostic value of infant examinations and their accuracy in predicting future intelligence. This immediately draws the question of intelligence tests and what they measure into the controversy. The literature on this subject is voluminous, and there would be little point in repeating material which has been quoted and re-quoted *ad nauseam*. The very acridity of the debate indicates how much scientifically controlled work in the field has yet to be done. The point of departure for the present study is Gesell's own statement "Functional tests of behavior define the integrity and maturity of the nervous system." Intelligence is both a qualitative and quantitative manifestation of the total functioning of the nervous system, particularly in the field of adaptive behavior.

The examination methods used in this study were designed and clinically applied to appraise all functions including intelligence. At the Clinic of Child Development these methods have proved themselves invaluable over a long period of years, both in the clinical diagnosis and in the prognosis of development.

B. The Study

The study was conducted in New Haven, Connecticut, a rather typical New England community of approximately 160,000 population, 3.9 per cent of which is Negro. The city, except for its educational institutions, is largely a commercial and manufacturing center. The status of the city and state is pointed up by its health record and is pertinent to this study (24).

> The State of Connecticut ranked in 1940 as the third lowest in the United States as far as infant mortality was concerned. Its 34.1 rate per thousand was surpassed only by Oregon (32.9) and Minnesota (33.1). In the East, Connecticut was leading in this respect. In 1931, 1932, and 1933, the City of New Haven won first place in its population group in the Health Conservation Contest of the American Public Health Association and the United States Chamber of Commerce. Unable to compete for first place because of these previous awards, New Haven in 1934 and 1935 was awarded Special Certificates of Merit. In 1936 New Haven took second place in its population group, and seventh for the whole country. In 1938 the city had the lowest infant mortality rate in its history (22.1 per 1,000) and the lowest in 88 United States cities. It received an honorable mention in the special non-competitive class and special mention in the tuberculosis contest. In 1940 New Haven withdrew from the Health Conservation Contest because "the pressure from defense activities in all agencies" was too strong. Nevertheless New Haven lowered its infant mortality rate to 21.7 per 1,000 in 1941 and its maternal mortality rate to 2.3 per 1,000. Since that time the development has been less favorable, although New Haven had the lowest infant mortality rate in the United States in 1942 (26.2 per 1,000). In 1944 New Haven had its highest infant mortality rate since 1936 (37.8 per 1,000).

A total of 53 Negro babies (28 male, 25 female), are included in this study. The infants were examined in a room in the basement of a unit of the Elm Haven Housing Project, which is located in the center of the largest Negro community in the city. Babies were examined during the regular clinic hours of the Well Baby Conference. The mothers and their children were seen as soon as possible after arrival, but some had to wait in a large waiting room where children were being undressed, weighed, and measured, with the usual tumult and crying. In the room next to our examining unit children up to three or four years of age were receiving physical examinations and immunizing injections to the accompaniment of an almost continuous uproar. These conditions are described to contrast them to those prevailing in the examining suites of the Clinic of Child Development, where there is never more than one child on a floor and disturbing factors are kept at a minimum. Except for one group, the white children included in this study were examined at the Clinic and the norms were, of course, established at the Clinic.

An older sibling or a nurse was usually present at the examination. This is in contrast to the Clinic where observers are concealed behind one-way vision screens. The children up to one year were examined on an oil-cloth covered kitchen table with the mother sitting on the right, examiner on the left. At the Clinic a crib with side panels is used, providing greater control and security. After one year of age, children were examined while sitting in their mothers' laps before the table.

Examination methods and materials are fully described in "Developmental Diagnosis" (17). The only variation which needs to be mentioned was the use of a portable framed mirror 10 by 12 inches which at times was found to be unsatisfactorily small for the more sophisticated babies.[2]

The 53 babies were children regularly seen at the Elm Haven Well Baby Conferences of the New Haven Board of Health and they fall within the group entitled to public post-natal care at a nominal fee. The conferences were originally intended for the medically indigent and the income limit was set at $40 a week for a family of three. This rule, however, was not strictly observed during the war years and higher income families are probably included. It is safe to say that the families used fall within the average or below average economic group.

According to the U. S. Census of 1940, 53 babies are approximately 40 per cent of the Negro infants born in New Haven during a twelve-and-a-half-month period (the length of time between the birth of the oldest and youngest infants in this study). Ward 19 of New Haven, from which all the Negro children in the study came, contains 48 per cent of the city's colored people (27) so that approximately 85 per cent of all the possible babies in this area were seen. They included almost all the babies who came or were scheduled to come to the Well Baby Conferences, of which there were two weekly. The writer divided his time between the two conferences, spending the first three months at the Thursday conferences and the following three months at the Friday meetings, returning the last two quarters to reexamine the children seen six months previously.

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[2] Before describing his subjects, it remains for the writer to describe himself, since the experimenter is a vital integer in any study of this kind, when rapport between child and examiner is so important. The examiner spent his childhood in New York City. He attended the University of Maryland School of Medicine and interned in Harlem Hospital, becoming acquainted with the Southerner's viewpoint on the Negro and his problems and acquiring first-hand knowledge of a Negro community. In addition to his psychiatric training he has sufficient natural sympathy for and understanding of the Negro people to prevent emotional attitudes from intruding upon the experiment or the interpretation of the results. Prior to undertaking this study he had six months of training and practide in the clinical methods and procedures of developmental diagnosis.

The only children excluded from examination were those born prematurely, whose development would be retarded by the amount of prematurity, creating difficulties in computation. Seriously ill children were automatically excluded since they were not permitted into the waiting room by the nurses in charge. One baby was examined by the writer at the request of the nurses because of supposed blindness. He was found to be seriously retarded and the diagnosis was later confirmed by examination in the hospital by another member of the Clinic staff. This infant also happened to be premature so that the question of his inclusion in this study did not arise. The reexamination results of one infant were excluded from the final tabulation. He was a child with a severe generalized eczema and marked crusting of the fingers, who could not be kept from scratching his pruritic lesions whenever his hands were freed from restraint.

The obstetrical records of 48 of the mothers who were delivered in New Haven Hospitals were available to the examiner. Morbidity and abnormalities during the prenatal period and delivery (where stated) include: tuberculosis (clinical but quiescent)—5; rheumatic heart disease—3; kidney disease—2; hypertension—2; Caesarian section—2 (transverse position—1, fetal distress—1); toxemia of pregnancy—1; extensive vaginal bleeding prior to delivery—1; breech delivery—1; right occiput posterior with prolonged labor—1. Two serious post-partum conditions should be noted: one post-partum depression and one inversion of the uterus. Two babies required resuscitation after birth. This is a rather extensive number of abnormalities.

The subjects themselves had a comparatively minor amount of illness prior to and during the study period. This included one case each of: diarrhea of unknown amount and causation, prolonged upper respiratory infection lasting six months, linear fracture of the skull, pneumonia—type undetermined, acute purulent otitis media, childhood tuberculosis—arrested.

Fifty-two notes of the type of feeding were made. Seventeen were fed on formulae by bottle and 35 were breast fed as follows: nine for two weeks to one month, nine for one to three months, three for three to six months, 14 for more than six months. For New Haven this is a rather large proportion of breast fed babies.

Three of the children were born out of wedlock. This is approximately 6 per cent of the group, compared to an illegitimacy rate of 4 per cent among Negroes of Connecticut. Other details of marital status are of interest here. Four mothers were separated from their husbands. Two fathers were deceased, both of tuberculosis.

Badger and Ross, in an unpublished report dated 1940 (1), state: "The majority of employed Negroes in New Haven fall into four classifications: laborers, servants, janitors and 'carrymen' (truck drivers, delivery men, etc.)." Because of the war this was not true at the time of this study and the largest category for the fathers was defense plant worker. In only a few cases did the wives know precisely what their husbands did in the factories, so that they are all lumped together in a group as factory workers in the table of occupations, which is arranged roughly according to the Barr scale ratings of occupational status (Table 1). Of these 15 were in the armed services, none commissioned officers; they are listed by their occupations prior to military service. The occupations of the mothers are included in Table 1.

In Table 2 the education of the parents of the children in the various groups under study are compared. The mothers and the fathers of the Negro infants received an average of 10.1 and 10.3 years of schooling, respectively, the approximate equivalent of two years of high school. When

TABLE 1

OCCUPATIONS OF NEGRO PARENTS

Fathers		Mothers	
Laborer	7	Laundry worker	4
Porter	2	Factory worker	12
Truck driver	2	Elevator operator	2
Janitor	1	Hairdresser	4
Factory worker	26	Domestic worker	23
Clothes presser	6	Stenographer	1
Mail carrier	1	Never employed	7
Electrician	2		
Mechanic	1		
Shipping clerk	1		
Proprietor cleaning and pressing business	1		
Chemist	1		
Pianist	1		
College student	1		

TABLE 2

EDUCATION OF PARENTS OF NEGROES, GROUPS W1 AND W3

Years	Fathers		Mothers		
	Negro	White (W3)	Negro	White (W1)	(W3)
0 to 4	1	—	1	—	—
5 and 6	4	—	—	1	—
7 and 8	4	—	6	8	—
9 and 10	10	—	18	10	—
11 and 12	26	1	21	25	—
13 and 14	3.	—	4	3	3
15 and 16	2	6	2	2	7
17 and 18	—	5	—	—	4
19 and 20	—	5	—	—	3
21 or more	—	1	—	—	—
Average years	10.3	17.6	10.1	10.6	17.0

TABLE 3

EDUCATION OF NEGRO PARENTS ACCORDING TO GEOGRAPHIC ORIGIN

Years of schooling	North		South	
	Fathers	Mothers	Fathers	Mothers
0 to 4	—	—	1	1
5 and 6	—	—	4	—
7 and 8	1	2	3	4
9 and 10	6	8	4	9
11 and 12	17	17	9	4
13 and 14	1	2	1	2
15 and 16	1	2	1	—
Average years	11.1	11.1	9.5	9.5

the education of parents from the North and South are compared (Table 3) it is immediately apparent that the latter had much less education.

Each house in which the Negro infants lived was visited by the writer and classified as bad, fair, or good. All the good housing (20 infants), except for one private dwelling, was in a public housing project where the rooms, although small, were clean, with good lighting and all modern heating and toilet facilities. The bad housing (26 infants) consisted of typical Negro slum dwellings similar to those found in almost every small or large city on the Eastern seaboard. The fair houses (7 infants) were judged to be somewhere between the housing project homes and the slum buildings. As might be expected, the male and female babies are divided equally throughout the various types of housing.

If housing and schooling are correlated, in the good housing group the fathers have an average of 11.1 years and the mothers 10.7 years of schooling, respectively 17 per cent and 14 per cent more education than the fathers and mothers who live in poor housing, where the averages are 9.5 and 9.4 years.

The geographical origin of the parents is recorded as follows: both from the South, 14; both from the North, 18; mixed North and South, 20. This gives birthplace only and it is not known when they left their place of birth. However, from other indications, such as years of schooling and type of housing correlated with nativity, it is reasonable to assume that a fair number had only recently arrived in New Haven.

If the type of housing is correlated with regional origin, it is revealed that while all three groups have their share of slum housing, those infants whose parents were both born in the South do not live in the housing project at all, possibly indicating that they came to the North too late to be placed on the long waiting list of the project.

The writer has no information as to income, but the defense plants of New Haven, probably the best paying jobs open to Negroes at this time, did not pay the relatively large salaries paid in some areas of scarce labor.

There are no statistics offered on how the parents of the infants studied stand in relation to the other members of the Negro community of New Haven. On the basis of the previous information given, however, it can be stated that the subjects were members of families quite representative of a cross-section of the New Haven Negro group socially, economically, and intellectually.

The average birth weights of the Negroes are compared to those of the white infant groups in this study in Table 4. The Negro boys were heavier than the whites and the Negro girls lighter. Except in Group W1, where the males and females are of approximately the same weight, the white males are too few in number in each group for accurate statistical evaluation. The Negro males are 317 grams heavier than the females.

The birth weights and lengths of the Negroes in this study are compared to those reported elsewhere in the literature in Tables 5 and 6.

In Figures 1*a* and 1*b* the weights of the Negro subjects of this study during the first 13 months of life are plotted on the same graph with comparable statistics for a group of Negro patients from a private practice and a group of white patients from a moderate income group. The heights of our subjects are compared to this same white group in Figures 1*c* and 1*d*.

On the second visit of the subjects, the degree of pigmentation of the babies and their mothers (if brought by the mother) was estimated. They were arbitrarily divided into four groups: black, dark brown, light brown, and very light brown. In all, four mothers were black, 20 dark brown,

TABLE 4
BIRTH WEIGHTS OF THE GROUPS OF PRESENT STUDY

Group	Males No. cases	Weight grams	Females No. cases	Weight grams
Negroes	28	3,416	25	3,199
Group W1	21	3,332	30	3,329
Group W2	7	3,269	13	3,512
Group W3	8	3,369	12	3,473

TABLE 5
BIRTH WEIGHTS OF NEGROES AND WHITES REPORTED IN THE LITERATURE

	Males				Females			
	Negro		White		Negro		White	
	No. cases	Weight grams	No. cases	Weight grams	No. cases	Weight grams	No. cases	Weight grams
Present study	28	3,416	21	3,332	25	3,199	30	3,329
Iowa 1921 (6)	60	3,408	71	3,629	70	3,340	67	3,714
Bellevue 1928-9 (2)	99	3,100	608	3,390	88	2,916	609	3,251
New Haven 1928-32 (14)	74	3,182	1,455	3,457	80	3,003	1,314	3,340
N. Y. C. 1935-6 (22)	480	3,300	150	3,500	449	3,100	120	3,330

TABLE 6
BIRTH LENGTHS OF NEGROES AND WHITES

Group	Males No. cases	Length cm.	Females No. cases	Length cm.
Negroes (New Haven) (Present study)	18	49.86	17	50.29
Whites (Iowa, 1921) (6)	29	52.38	24	53.87

and nine light brown, while 21 infants were dark brown, 11 light brown, and two very light brown, indicating that the mothers as a whole are much darker than their children. The two children who were very light brown had distinctly negroid features although one had blue eyes. The fact that children under a year of age are lighter than their adult color is commonly accepted. Davenport (11), in a study of the "Heredity of Skin Color in Negro-White Crosses," after evaluating the skin pigmentation in children and adults stated: "It appears that the proportion of black in the skin increases to about the age of 10 or 12 years and then slowly diminishes. . . . On careful consideration of these facts it seemed desirable to exclude from further consideration . . . all measurements made on individuals under the age of two years, on the ground that such individuals have not yet gained their full pigmentation; that in them melanic pigmentation is in an embryonic condition."

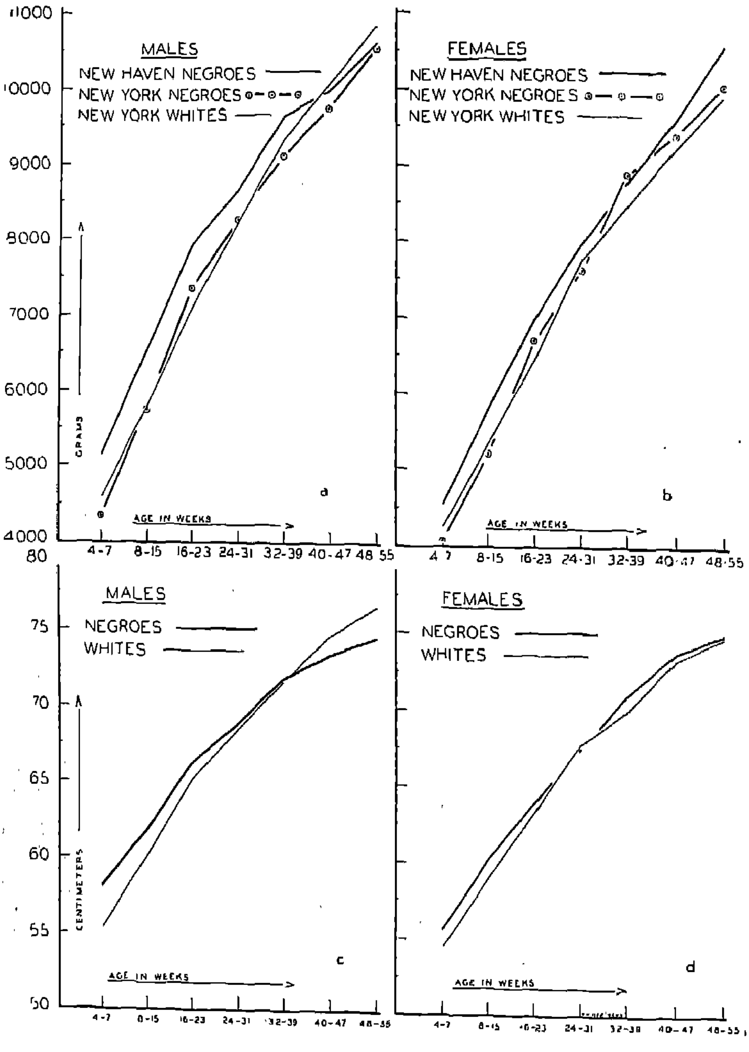

FIGURE 1

(*a*) Weights of Negroes of Present Study Compared with New York Negroes from a Private Practice and New York Whites from a Moderate Income Group (Eight-Week Intervals, Males). (*b*) Weights of Negroes of Present Study Compared with Same Groups (Eight-Week Intervals, Females). (*c*) Heights of Negroes of Present Study Compared with New York Whites from a Moderate Income Group (Eight-Week Intervals, Males). (*d*) Heights of Negroes of Present Study Compared with Same White Group (Eight-Week Intervals, Females).

The subjects are also tabulated according to whether or not they have siblings, and are almost equally divided among male and female babies. There were 14 females with siblings, 11 without, 15 males with and 13 without.. Almost all those with siblings had one or more under six years of age.

The group of Negro babies is subdivided into two groups. The first group, referred to as N1, was examined initially at any age under a year and then reexamined, when possible, approximately six months later. The second group, N2, was examined at 16 weeks and then again at 40 weeks of age. No more than three days on either side of these scheduled ages was permitted. Of this group it was necessary to examine three in their homes for various reasons in order to secure a sufficient number of reexamined N2 children. The writer must again express his gratitude to the nurses of the Visiting Nurse Association who visited and re-visited homes in order to have the children come for examination at 16 weeks and again for reexamination at 40 weeks. An attempt was made by these nurses to have all the children return, but for a number of reasons only 34 were seen twice.

The Negro subjects were compared with three separate groups of white babies, as follows:

1. *Group W1. Illegitimate infants in foster homes.* This group, containing 57 babies (25 males, 32 females), was composed of all the infants under one year who were seen by the writer at the Clinic of Child Development for evaluation as candidates for adoption.

As a rule, the children received excellent care in boarding homes. Foster mothers during the war years who were willing to board children for the nominal sums granted by the various child-caring agencies were obviously performing a labor of love. The children who were already in adoption homes when seen were also, almost without exception, receiving very good care.

There was no instance of any abnormality in the prenatal period or natal history in this group.

Where recorded, the occupations of the natural mothers are arranged roughly according to the Barr Scale of occupational status as follows: Waitress—2; factory worker—11; domestic—1; clerical worker—7; high school student—1; laboratory technician—1; nurse—2; college student—1; housewife—2. The occupations of 29 were unknown.

The mothers of this group received an average of 10.6 years of schooling (Table 2), an amount only slightly higher than the Negro parents. The fathers of the children in this group were unknown or only alleged, so that no information on them is included here.

2. *W2. Illegitimate infants in an institution.* These children, 22 in number (7 males, 15 females), only a small number of whom were examined by the writer, were seen in the small orphanage for preschool children in which they resided. This is a carefully selected group limited to children who were normal initially or who rose to within the average developmental range on reexamination at the Clinic of Child Development after a period, more or less prolonged, of foster home care. They were chosen to illustrate the effect of environmental conditions upon infant development.

These children lived in two large nurseries containing approximately 20 babies under one year of age, and were cared for by two to three nurses. Of necessity, no individualized care was possible, and about the only time they received any social stimulation was during change of diapers. At such times some special effort was made to offer each child a modicum of attention. The effects of such environmental impoverishment are well-described elsewhere (17).

In this group two instances of abnormality during delivery are recorded: one was born after a difficult instrumental labor and the other was a breech delivery, during which the left humerus sustained a fracture which healed quickly.

3. *Group W3. Nursery school applicants.* This group numbered 20 babies (8 males, 12 females) examined by the writer. They were children whose parents had applied for their admission to the Nursery School of the Clinic of Child Development and were examined as infants for research purposes prior to their later admission to the nursery. They came largely from superior homes, as can be observed from the education of the parents (Table 2) and their occupations which were recorded as follows:

Fathers: one each—defense worker, railroad conductor, factory foreman, teacher, army officer, personnel administrator, minister, radio engineer, university instructor, lawyer, editorial writer, university professor; two graduate students and four physicians.

Mothers: one each—social worker, teacher, physician; three nurses. The remainder of the mothers in this group listed themselves as housewives.

The fathers in this group received 17.6 years and the mothers 17.0 years of schooling. This is the equivalent of four years of college and one year of post-graduate university or professional study, and is approximately 70 per cent more schooling than the Negro parents received.

There was no instance of any abnormality in the prenatal period or natal history in this group.

The Negro infants to be examined were either brought to the Well Baby

Conference by appointment, as in the case of Group N2, or had come as part of the usual clinic routine. An attempt was made, not always successfully, to see the babies before they were undressed, weighed, and measured, since this usually resulted in more or less vigorous protest with consequent difficulties in adjusting to the examination. Infant and mother were escorted to the examining room, and while the baby was held in the mother's lap, a short interview, lasting not more than five minutes, took place. Name, age, occupation, and education of the parents were determined as well as number and age of siblings, the infant's birth date, birth weight, whether premature, post-mature or full term, complications of pregnancy, duration of labor, type of delivery, baby's condition at birth, condition during the first month, and subsequent health history. These were subsequently verified in most instances from the hospital records and the Conference charts. In addition reported items of motor, language, play, domestic, and emotional behavior were recorded. This interview was intentionally held before examining the child to allow some time for him to become accustomed to the examiner. If necessary he was offered a small toy during the interview and this was removed at the beginning of the examination. Most mothers thoroughly enjoyed watching the examination and gave evidence of pride and affection. There were a very few who were a little suspicious at the outset but all expressed a willingness to return for reexamination.

Immediately after each examination the performance was checked off on a Yale Developmental Schedule form and in the case of Group N2 on the Tables of Individual Behavior Items (p. 21). A few words of comment on adjustment and outstanding behavior patterns were added to the record.

The Developmental Schedules were gone over and with the entire picture of behavior gained by the examination in mind the writer then proceeded to evaluate the fields of gross motor, fine motor, adaptive, language, and personal-social behavior and to each a *clinical* maturity level in weeks was supplied. The writer cannot emphasize too strongly that these were clinical evaluations. No attempt was made to add behavior items unrelated and unequal in value to achieve a sum from which a so-called "intelligence quotient" was reached. On the contrary, only by fitting disparate behavior items into appropriate behavior patterns and integrating these to form the behavior picture of the child as a whole, can a complete view of the developmental implications be obtained.

As stated by Gesell and Amatruda (17):

> Developmental diagnosis does not attempt a direct measurement of intelligence as such, but should aim at clinical estimates of mentality

> based upon an analysis of maturity status. . . . In clinical hands, the *DQ*[3] is an analytic tool, a diagnostic indicator, which consistently limits itself to the problem of maturity status. It is based on a determination of developmental level and can be discriminatively applied to specific aspects and fields of behavior. It does not attempt to quantify an all-inclusive function in a single formula.

It is in this sense and for convenience of demonstration and comparison that the writer uses the Developmental Quotient. In accordance with the methods of clinical analysis employed, our findings will be discussed in relation to the four major fields of behavior as outlined by Gesell and Amatruda.

> The motor capacities of the child constitute the natural starting point for an estimate of his maturity. Both gross bodily control and the finer motor coördinations must be considered: postural reactions, head balance, sitting, standing, creeping, walking; prehensory approach on an object, grasp and manipulation of the object.
>
> Adaptive behavior lends itself to similar diagnostic scrutiny. Here we reckon with the finer sensori-motor adjustments to objects and situations: the coördination of eyes and hands in reaching and manipulation; the ability to utilize the motor equipment appropriately in the solution of practical problems; the capacity to initiate new adjustments in the presence of simple problem situations which we set before the infant.
>
> Language behavior likewise assumes distinctive patterns which furnish clues to the organization of the infant's central nervous system. We use the term broadly to include all visible and audible forms of communication, whether by facial expressions, gesture, postural movements, vocalizations, words, phrases, or sentences. Language behavior, moreover, includes mimicry and comprehension of the communications of others. Articulate speech is a socialized function which requires social milieu but which, nevertheless, depends upon the readiness of sensori-motor and cortical structures.
>
> Personal-social behavior comprises the child's personal reactions to the social culture in which he lives. These reactions are so multitudinous, so variegated and contingent upon environment, that they would seem to be beyond the reach of developmental diagnosis. But here as elsewhere we find that the patterning of behavior is fundamentally determined by intrinsic growth factors. Bladder and bowel control, for example, are cultural requirements; but their attainment depends primarily upon neuro-motor maturity. So with a large number of the child's abilities and attitudes: his feeding abilities, his sense of property, his self-dependence in play, his coöperativeness, his responsiveness to training and to social conventions. Personal-social behavior is par-

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[3] Developmental Quotient $= \dfrac{\text{Maturity Age}}{\text{Chronological Age}} \times 100.$

> ticularly subject to individual variations, but these variations have normal limits.

It must be recognized that it is not possible to add the quotients arrived at in each field and obtain a sum which is an all-inclusive developmental quotient. The sphere of adaptive behavior is undoubtedly closest to that which is called "intelligence" and is also the field which is given most consideration in evaluating the maturity of any child. Motor behavior is usually the field in which the layman reckons maturity level but it is probably the least reliable indicator of "intelligence" in infancy. Motor behavior is here divided into gross and fine motor for better definition and because significant differences are found in this study. The estimation of the language and personal-social maturity levels is largely based on report which is subject to error and exaggeration, but its credibility is similar to that of other fields of behavior which can be checked by the examination.

C. Findings

1. *Inter-Racial Findings*

a. Total Negro Group and Groups W1, W2, and W3. The comparative gross findings of this study are graphically represented in Figures 2*a* and 2*b*, and Table 7. The outstanding features are the distinctly low scores made by Group W2, the institutionalized infants (all potentially average as shown by their later examinations after foster home care) in all spheres of behavior, and the height of the quotients achieved in the Gross motor field by the Negro babies. On the first examination the Negro group as a whole falls between the children in foster homes (W1) and those coming from superior backgrounds (W3). By the second examination the Negro group leads in language behavior. On the other hand, Group W3 is to some extent advanced in fine motor behavior in both examinations.

TABLE 7

Trend Differences in Arithmetic Developmental Quotients of the Negro Infants (Groups N1 and N2), Groups W1, W2 and W3

Field of behavior	First examination Negro (53)	W1 (57)	W2 (22)	W3 (20)	Second examination Negro (34)	W1 (18)	W3 (13)
Gross motor	109	102	89	103	114	102	106
Fine motor	102	99	81	106	106	98	109
Adaptive	102	99	85	104	107	99	107
Language	106	99	84	97	107	100	101
Personal-social	105	104	83	105	108	103	108

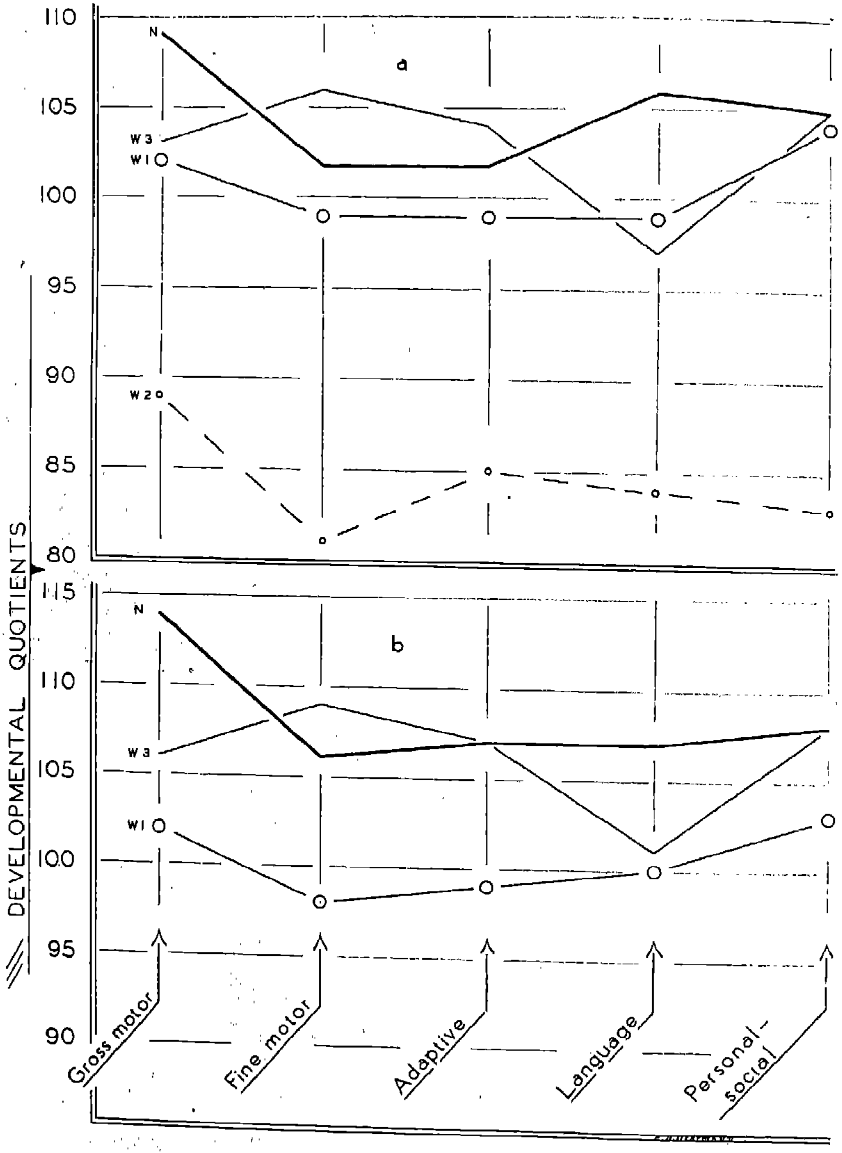

FIGURE 2
(*a*) Developmental Quotients of Negroes, and Groups W1, W2, and W3, First Examination. (*b*) Developmental Quotient of Negroes, and Groups W1 and W3, Second Examination. (Curve for W2 Would Resemble that of W1.)

b. Group N2 and the norms. Immediately after the examination of each Negro infant the performance was checked on the Yale Developmental Schedules and for the N2 group also on the *Tables of Individual Behavior Items*—275 items at 16 weeks and 350 at 40 weeks. This minute analysis of the behavior of Group N2 at the 16- and 40-week age levels was done for a number of reasons. First to compare directly and in as detailed a manner as possible the Negro group under study with the group from which the Yale Developmental Schedules were prepared and with which all the groups have been compared. Secondly, it was felt that if any pronounced trend in a deviant direction was present it would be more easily discernible in a finely dissected study. Thirdly, it was the only method of obtaining a detailed record without secretarial aid. And fourthly, it would give anyone who wished to repeat or amplify this study a record which could be used for direct comparison.

The behavior levels are divided clinically by the writer into behavior which is low (*L*) for the age level, at-age behavior(*A*), and behavior high (*H*) for the chronological age. These can be illustrated descriptively, for example, by the type of fine prehension of the 6 mm. pellet at the 40-week level. The at-age behavior at 40 weeks is the inferior pincers type of grasp, i.e., opposition of the volar surfaces of index finger and thumb upon the object, the remaining digits and palm resting upon the table to steady the hand for the maneuver. The low-age behavior at 40 weeks (but at-age at 36 weeks) is the scissors type of prehension in which the object is grasped between the volar surface of the thumb and the radial side of the index finger. The high-age grasp is the neat pincers plucking of the pellet between the volar surfaces of thumb and index finger as before but with no other portion of the hand touching the table, since coördination has progressed to the point where support is no longer required. This would be an at-age item for 48 weeks of age.

An item was designated as low-age, at-age, or high-age not entirely on the basis of the percentage of positive responses obtained in the original normative series of white infants, but also on the basis of its relationship to the total situation and to the type of response obtained at older and younger ages.

The items for the pellet situation are herewith presented in detail to illustrate the fine analysis. The separate items were not chosen haphazardly by the examiner but were actual performances of the infants, as revealed by the dictated records.

Pellet behavior at 16 weeks: (1) follows examiner's hand (*L*); (2)

prompt regard (*H*); (3) delayed regard (*A*); (4) questionable regard (*L*); (5) brief regard (*A*); (6) fleeting regard (*L*); (7) prolonged regard (*H*); (8) prefers to regard examiner (*L*); (9) prefers to regard surroundings (*L*); (10) prefers to regard hands (*L*); (11) hand regard (*L*); (12) regard travels from hand to pellet (*H*); (13) active regard (*H*); (14) passive regard (*A*); (15) no regard (*L*); (16) continues previous activities (*L*); (17) scratches table top (*H*); (18) hands active (*A*); (19) arms increase activity (*H*); (20) contacts (*H*); (21) strains towards (*H*); (22) hands engage (*H*).

Pellet and bottle behavior at 40 weeks: (1) reaches for pellet first (*A*); (2) reaches for bottle first (*L*); (3) takes pellet first (*A*); (4) takes bottle first (*L*); (5) bangs bottle (*L*); (6) bangs bottle on pellet (*H*); (7) transfers bottle (*L*); (8) carries bottle to platform (*H*); (9) eventually takes other object (*A*); (10) transfers pellet (*H*); (11) twiddles pellet (*H*); (12) drops pellet (*L*) (13) flips or scratches at pellet (*L*); (14) drops one for the other (*L*); (15) tries to transfer pellet (*H*); (16) takes bottle to mouth (*L*); (17) takes pellet to mouth (*H*); (18) holds both (*A*); (19) disregards pellet (*L*); (20) plays with pellet exclusively (*H*); (21) pellet to bottle (*H*); (22) releases pellet (*H*); (23) pellet over bottle with release (*H*); (24) grasps pellet (*A*).

It might be thought that since the examiner had the list of behavior items before him and checked each item for each child that he might have recalled a greater number of positive performances for Group N2 than was recorded for the white research group where the tables were made from the dictated record. However, Table 8 reveals that for the low-age behavior items fewer positive observations were recorded for the Negroes.

TABLE 8

NUMBER OF ADAPTIVE BEHAVIOR ITEMS IN WHICH THE NEGRO INFANTS OBTAINED A LOWER, THE SAME, OR A HIGHER PERCENTAGE OF POSITIVE RESPONSES THAN THE WHITES

Percentage	Low-age	At-age	High-age
		16 weeks	
Lower	11	2	1
Same	2	5	6
Higher	1	15	21
Total	14	22	28
		40 weeks	
Lower	7	1	3
Same	1	2	4
Higher	0	22	13
Total	8	25	20

Since these are normal average infants, a considerable amount of overlapping with the norms is to be expected. When all the behavior, totalling some 275 items at 16 weeks and 350 items at 40 weeks are analyzed, the Negro group consistently displays a smaller number of low-age behavior items and a greater number of at-age and high-age behavior items than the white group. In other words, the Negro is, on fine analysis, slightly more mature than the normative white infant with whom he has been compared. Table 8, using for illustration only the adaptive behavior items (numbering 117), vividly reveals this trend. (The complete material of the fine analysis is available for inspection or photostatic copies will be prepared on request.)

When two Negro groups are compared (Table 9), one of which (Group N1) was checked on the Yale Schedules alone, the other (Group N2) finely recorded on the Tables of Individual Behavior Items and then checked on the Yale Schedules, we again find no significant differences. Finer and more immediate recording did not augment behavior.

TABLE 9
TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF GROUPS N1 AND N2

Field of behavior	N1 (30) 1st exam.	N2 (23) 16 wks.	N1 (17) 2nd Exam.	N2 (17) 40 wks.
Gross motor	111	104	111	117
Fine motor	99	106	109	103
Adaptive	103	101	107	108
Language	104	108	106	107
Personal-social	106	103	105	110

2. *Intra-Racial Findings*

a. Sex. Little attempt was made to correlate intrinsic or extrinsic factors and development in the white groups, because this is intended largely as a study of the developmental status of Negro infants. However, since sex differences were mentioned previously, it might be well to list the intraracial white male and female developmental variations (Table 10).

Varying opinions in the few reports on sex differences in the developmental status of infants are found in the literature (25). The larger number, however, state that the female baby is a little advanced in some fields of behavior. In Group W1, the females are uniformly but slightly ahead of the males in development. The results of comparison in Group W3 are somewhat ambiguous, possibly the result of the small number of cases. The females lead in gross motor and language behavior while the males are

TABLE 10

TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF WHITE MALE AND FEMALE INFANTS (GROUPS W1 AND W3)

	First examination			
	Group W1		Group W3	
Field of behavior	Males (25)	Females (32)	Males (8)	Females (12)
Gross motor	100	103	97	107
Fine motor	97	100	107	105
Adaptive	98	100	106	105
Language	99	100	95	99
Personal-social	103	105	109	104

TABLE 11

TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF NEGRO MALE AND FEMALE INFANTS

	First examination		Second examination	
Field of behavior	Males (28)	Females (25)	Males (18)	Females (15)
Gross motor	108	110	112	116
Fine motor	102	102	104	107
Adaptive	101	103	104	110
Language	106	105	102	112
Personal-social	106	103	108	108

ahead in the personal-social field. Group W2 is predominantly female and is omitted from consideration.

Much more definite differences occur between the Negro males and females (Table 11). In the first examination only a slight advantage in adaptive and gross motor behavior for the females over the males exists, with the reverse being true in the personal-social field. By the second examination, however, the difference in personal-social behavior has been eliminated and in all the remaining fields, particularly in adaptive and language behavior, the females are more advanced.

b. Pigmentation. The Negro infants were divided into two groups, light and dark. The degree of pigmentation assigned on the second visit (p. 13) was used as a basis of comparison. The results are seen in Table 12. On the first examination the light babies are somewhat ahead of the dark

TABLE 12

TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF LIGHT AND DARK NEGRO INFANTS

	First examination		Second examination	
Field of behavior	Light (13)	Dark (21)	Light (12)	Dark (21)
Gross motor	108	106	111	115
Fine motor	116	100	107	105
Adaptive	103	99	108	107
Language	105	103	98	106
Personal-social	105	103	111	105

ones, particularly in the fine motor field, where a marked difference is apparent. In the second examination the dark infants have caught up with the light ones and lead in gross motor and language behavior, although still behind in the personal-social sphere.

c. *Schooling of parents.* The years of education of both parents (Table 2) were inventoried and the subjects divided into two groups by the median of 10.5 years of schooling. The developmental quotients of the resulting groups are compared in Table 13. In the first examination, despite the fact that one group has an average of 37 per cent more education than the other, the results are very much alike except for some acceleration in language by the children of the group with more schooling. On the second examination the results, if anything, are slightly in favor of the babies whose parents had less schooling.

TABLE 13
TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF NEGRO INFANTS OF HIGH AND LOW EDUCATIONAL BACKGROUND

	First examination		Second examination	
Field of behavior	Average schooling 11.8 yrs.	Average schooling 8.6 yrs.	Average schooling 11.8 yrs.	Average schooling 8.6 yrs.
Gross motor	107	111	113	115
Fine motor	102	102	104	106
Adaptive	102	102	106	108
Language	110	102	106	106
Personal-social	106	103	106	108

d. *Geographical origin.* The developmental quotients of the subjects were correlated with the geographical origin of the parents (Table 14). In the first examination the infants whose parents were born in the North are definitely accelerated in respect to the two other groups. However, a surprising reversal takes place in the results of the second examination. The group of children with Southern-born parents jumps into the lead the dis-

TABLE 14
TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF NEGRO INFANTS OF NORTHERN AND SOUTHERN PARENTAL ORIGIN

	First examination		Second examination	
Field of behavior	South (14)	North (18)	South (10)	North (12)
Gross motor	108	111	117	117
Fine motor	101	106	111	100
Adaptive	99	106	110	105
Language	104	112	113	99
Personal-social	102	106	108	111

tance it had lagged behind in the prior examination and the group from the North loses ground in the fine motor and language spheres.

e. Weight. Here again, both males and females were each divided into two groups by the median birth weight. On the whole, the children heavier at birth are favored in most fields of development. The field of adaptive behavior is chosen for illustration and in Figure 3 the developmental quotients in this field are graphically represented for each of the four groups. In addition, the low-weight groups of males and females were combined, as were the high-weight groups of males and females, and the quotients for these two groups added to the chart (represented as total group) The highest average score in adaptive behavior, 113, is earned in the second examination by the heavier females with an average birth weight of 3,739 grams.

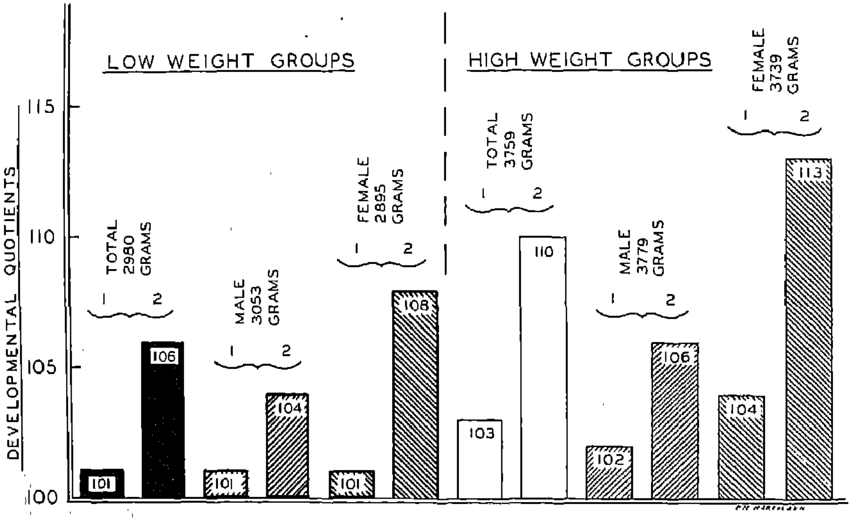

FIGURE 3
Developmental Quotients in Adaptive Behavior, Comparing the High and Low Birth Weight Groups (First and Second Examinations)

f. Compared with self (Progress). When the results of the first and second examinations of the Negro group are compared (Figs. 2*a* and 2*b* and Table 7) it is immediately apparent that slight but significant acceleration took place in all spheres of behavior on the second examination. This is also true for Group W3, the children of superior backgrounds, but not true for Group W1, the illegitimate children in foster homes. W2, of course, showed a tremendous gain, directly correlated with the enrichment of their environment.

g. Correlations with environmental factors.

(1). *Siblings.* The number of male and female children with and without siblings are quite comparable so that, in considering the influence of this factor on development, sex is disregarded. In almost all fields of behavior, in both examinations, the first-born infants do slightly better than those who have siblings.

(2). *Housing.* The babies living in good and fair housing facilities were combined and their development compared to those living in slum housing. Here again, in almost all fields of behavior on both examinations, those living in the better homes are in the lead.

(3). *Housing and sibship.* When both of these extrinsic factors are correlated with development (Table 15) a much more significant result is found. The lowest average scores recorded, namely in gross motor, adaptive and personal-social behavior, are found on the first examination in the infants living in poor housing with siblings. The single lowest mean score in any field of behavior in the Negro groups is found on the second examination in the language behavior (94) of the babies without siblings from the poor houses.

TABLE 15
TREND DIFFERENCES IN ARITHMETIC DEVELOPMENTAL QUOTIENTS OF NEGRO INFANTS: GOOD AND POOR HOUSING CORRELATED WITH SIBSHIP

	First examination				Second examination			
	Good housing		Poor housing		Good housing		Poor housing	
Field of behavior	With sibs (16)	Without sibs (11)	With sibs (13)	Without sibs (13)	With sibs (11)	Without sibs (6)	With sibs (10)	Without sibs (6)
Gross motor	107	113	106	110	112	120	115	110
Fine motor	102	105	101	101	105	104	107	108
Adaptive	102	104	98	104	109	110	106	105
Language	107	110	102	103	100	110	109	94
Personal-social	105	106	100	107	109	110	105	106

3. *Note on Personality of Negro Infants*

This study is devoted primarily to the objective behavioral development of Negro infants. It is true that personality in the broad sense cannot be separated from developmental and maturity factors, but because of the circumstances of the study it was impossible to devote much time to the consideration of this insubstantial factor. However, a few notes were made and the writer will venture to draw some generalizations, the validity of which, while holding more or less for the group in question, cannot be used sweepingly because of the heterogeneity of the babies when they are considered individually.

The most outstanding feature was the remarkable ease with which the examinations were conducted. Only one attempted examination, a 16-week-old infant who could not be awakened, could not be completed. Otherwise, every examination, once begun, was carried through to a successful conclusion, despite some of the unfortunate surrounding factors. This compares favorably with the adjustment of the white babies seen at the Clinic of Child Development, where an attempt is made to have the children examined during their happiest play period of the day, without interfering with nap or feeding times.

There was some crying or fussing during the course of the examinations. It was noted eight times during the first visits and four times during the second examinations. Three of these were directly related to a sudden outburst of loud screaming in the next room and three, interestingly enough, began when the babies saw their images for the first time in the mirror. Crying stopped when the mirror was removed and resumed when it was brought back. In many thousand examinations at the Clinic of Child Development this has never been observed in white babies. None of the crying periods were of long duration and when necessary the babies were picked up and comforted by their mothers before resumption of the examination.

Almost all children over 12 months showed some timidity and fear, probably due largely to memory of previous physical examinations and injections at the Conference. The writer is unable to evaluate the effect of his white skin, but it appears to have played a very minor rôle, if any, at this age. At least half the babies had had physical examinations by a white female physician, the other half by a white male. All the nurses at the Conference were white but one.

On the other hand, in contrast to the white babies, there was comparatively little smiling during the course of the examination. As a group the Negroes were sober but not at all impassive. The writer finds that he made five remarks of "friendly" or the equivalent on the first examination and the same number on the second. As a general rule they devoted themselves closely to the task in hand, largely ignoring the examiner. On the first examination 17 notes of well-sustained drive and attention were made. Comparatively few notes of disinterest, poor attention, or disorganization were made. Inhibition towards materials increased noticeably with age, but was seen in only a small minority of subjects.

Only two babies displayed the type of personality structure which might have psychiatric implications later in life, and in both, interestingly enough, hereditary factors appeared to play some rôle. The first was the daughter of a veteran who had been discharged from the service for neuropsychiatric causes with the diagnosis of psychopathic personality. She was a disturbingly disorganized child. After the first examination at 42 weeks of age the writer commented: "quite hyperactive and in continuous motion—activity almost extended to point of disorganization—span of attention was short and drive of only fair quality—adjustment rather immature." After the second examination at 16 months he wrote "adjustment good enough—behavior, however, definitely disorganized—regard jumps quickly from object to object and around the room—interest quite short-lived, although she returns to the materials—definite difficulty and almost inability to concentrate on one situation." Father and mother were separated recurrently and he was in and out of the home. The mother worked and the child was cared for by an aunt during the day and she was, therefore, shifted from place to place.

The other child was seen first at 22 weeks and the writer stated then: "adjustment to examination quite poor—replaced in supportive chair three or four times with crying after a short interval—also cried in supine—finally examined seated in mother's lap and fussed there occasionally—mother states that he does a good deal of crying at home also." On the second examination at 47 weeks, the notes were, "appears quite sensitive and insecure—when placed upon the table reached silently and continuously for his mother, paying no attention to the material, and was finally examined sitting in her lap—extremely inhibited—it was minutes before he would even accept a cube from his mother or examiner, and throughout the remainder of the examination approach and exploitation were at the barest minimum for evaluation—cries a good deal at home." The mother was judged by both the examiner and the visiting nurse to be a highly immature, insecure person who had a good many emotional difficulties. Both children were judged to be a little above average developmentally.

There were a few notes of hyperactive, vigorous, boisterous behavior made, but more than twice as many comments of gentle, well-controlled behavior were found, and this stands out as noteworthy in contrast to the white infants as a whole. This last characteristic was occasionally accompanied by slow, deliberate movements.

In general this group of Negro infants was highly stable and of normal maturity and integration. There are no detectable basically "racial" characteristics in personality.

D. Discussion

To sum up all the statistics, tables, and graphs of the preceding section conservatively, it can be said that developmentally the Negro infants of this study, as a whole, did a little better than the normative group of New Haven white children from whom the Yale Developmental Schedules are derived, and that they fall between the group of white children in foster homes and the white children from highly superior backgrounds. Anyone who wishes to dispute the statistical validity of the differences in the arithmetical developmental quotients presented will not find an antagonist in the writer, but the general conclusion he regards as valid. This finding agrees with the writer's clinical evaluation before the developmental data were computed.

It was the writer's impression prior to beginning this study that Negro children were precocious in gross motor development, and a number of pediatricians and other independent observers were also of this opinion. Those who had been judging maturity by these easily reportable standards were conscious of this fact and stated that there must be a rapid deterioration in development as Negroes grew older because "intelligence" did not keep pace with motor function. This study fully corroborates the previously stated impression of accelerated gross motor behavior in Negro infants.

The writer can recall being taught in his early schooling that one of the reasons the South was largely agricultural was because of the inability of Negroes to handle machinery and their ineptitude with delicate instruments. It was, therefore, interesting to compare the fine motor behavior of our Negro babies with that of the whites. At these age levels, there is no difference between the two groups.

Similarly language and personal-social fields of behavior have been variously estimated as higher or lower in quality, usually lower. In this study, the personal-social behavior of the Negroes is equal to that of the white children with superior parents, and language is higher. It must be noted, however, that these fields of behavor are to a large extent judged by reported behavior and as such their relative reliability is not as great as when behavior is observed. In view of the reliability of the mother's report of behavior which could be directly checked, however, these differences in the language and personal-social spheres cannot be put aside without some comment. In large measure, these fields of behavior are a product of maturity and of environmental factors. The writer is unable to say, and in fact does not believe, that the Negro mothers spent more time with their children or enjoyed their company more, although if this were true it would help explain the difference by weighting the environmental factors. Another more plausible reason for the lower score for the whites may be that the superior white mothers possibly reported behavior more conservatively.

It is the field of adaptive behavior, as the prime indicator of maturity and intelligence factors, which deserves the closest study. In the first examination given the Negro infants they placed midway between the norms and the Nursery School babies. On the second they made precisely the same score as the Nursery School group. Immediate conclusions, however, cannot be drawn from these figures, and as the writer has stated previously, quantification of behavior must be used warily and as an indicator but not as the final summation. It might be thought odd that white children with such superior parents made such low scores as 104 and 107 in adaptive behavior in comparison to the doubtlessly higher *IQ*'s they will have when older. In this respect, it is necessary to quote Gesell and Amatruda, who say in their chapter on "Precocity" (17): "The ratings on the developmental schedules do not always give clear evidence of acceleration in the first year. . . . Although the scorable end-products may not be far in advance of the age norms in early infancy, a superior quality is clinically manifest in the manner of performance." They further state:

> Superiority, like amentia, is a protean term. Generalizations are hazardous. In an infant, superior endowment is denoted as a heightened capacity to grow and to assimilate. This capacity is not easy of diagnosis in its early manifestations, although we may safely assume it is present from the start. Diagnostic norms and cultural habits are better suited to reveal subnormality and inferiority. Latent powers are often so masked or obscured that it takes exceptional clinical insight to recognize their symptoms. Nevertheless there are several types of infants who display recognizable symptoms to a significant degree, under the conditions of the developmental examination.
>
> Developmentally, as already indicated, acceleration is a major symptom of superior potency. It may not be a universal symptom but it is nature's favorite method of loading the dice. When she is most prodigal she not only hastens the ontogenesis, she lengthens its total duration. And to make trebly certain she intensifies the speed of adaptive reactions. By these three devices the organism gains a tremendous amount of extra time over its more pedestrian companions. In the end society benefits from this extra time, but the devices themselves are essentially biological and to some extent open to observation and measurement.

They also describe the early symptoms of superiority (17).

> Whether he arrives at a given stage of development before his time or not, the superior child shows excellence in the way in which he

> performs. He is emotionally sensitive to what is happening in his environment. He looks alertly; he draws inferences as manifested by his intelligent acceptance of novel situations; he establishes rapport; he coöperates. In concrete ways he shows insight and foresight in the complex of events that comprise his visit to the doctor. Once the examination is under way he gives focal, marginal, and anticipatory attention to the test situations. He shows resourcefulness in exploitation; he shows initiative, independence, and imitativeness; he is likely to give a good performance even if he happens to be somewhat irritable or sleepy. Even during the first year of life the positive behavior characteristics are so well defined that one uses, by way of description, adjectives which are usually reserved for older children: poised, self-contained, discriminating, mature demeanor, etc.
>
> When there is no frank acceleration, superior endowment declares itself in the dynamic intensification and organization of the behavior assets. The total output of behavior for a day or a week proves to be more abundant, more complex and subtle than that of a mediocre child. When these dynamic differences are recognized it becomes clear that there are infants who may be characterized as superior in their own present rights, as well as in their promise.

In the highly selected Group W3 there were many who could be described in such terms. There were a significant number of Negro babies who also fell into this classification of potentially superior children. The writer can state without qualification that the adaptive behavior of this group of Negro infants was fully equal to that of the average New Haven white baby. It is highly probable that a large percentage of the Negro families are actually above the social and economic level where society places them; certainly their infants are average or better in development. The writer states this advisedly, knowing that almost all previous studies in older children and adults judge the Negro to be inferior, and that the two previously published studies of Negro *infants* describe a lower rate of development for the Negroes of an order of magnitude consistent with their reported status in later life. He will attempt to explain his discrepant findings and to find some proof for his explanations.

In this study a number of factors which have been used in other studies as indicators of more or less innate characteristics have been correlated with the development of the subjects. For instance, depth of pigmentation has been used as an indicator of relative admixture of white blood. Were this so, and were the white children superior, it would follow that the lighter the Negro, the higher his standing. And in fact, a number of reports give this as their finding. However, a large number of studies contradict this and such anthropologists as Herskovits state that amount of pigmentation is not directly related to the amount of Negro blood. The writer thought it of value to correlate his findings in this respect and certainly no very significant differences were apparent on the first examination and what slight differences did exist were not borne out by re-examination (Table 12).

In numerous studies of children the education of the parents has been used as an index of their intelligence. The hazard of such usage is apparent although most of the studies report a positive correlation. Using the schooling of Negro parents as an indicator is even more hazardous because educational facilities are notoriously disadvantageous to the Negro in the South and are adverse throughout the whole country. In the two groups of Negroes compared in this study, in one of which the parents had the equivalent of a grammar school education and the other had approximately a high school education (Table 13), no differences of any importance were found. Indeed the babies of the former group were very slightly better on the second examination.

Again in a number of reports, the Negroes from the North have been compared with those from the South. The latter are almost invariably found inferior. In this study, on the first examination children with Northern parents did much better in adaptive behavior than those of Southern origin (Table 14). On the second examination, however, this relationship was completely reversed and the babies whose parents came from the South led. Some reason for the difference on the first examination might be found when housing and development are correlated. The Southern group had by far the worst housing in the city. The comparison of housing and developmental quotients is one of the few intra-racial correlations which shows consistent advantage on one side of the ledger, namely, in favor of the group with better housing. No explanation for the reversal on the second examination can be offered.

The other extrinsic factor which is correlated with development is the number of siblings. It was felt by the writer that when the mother of the infant was forced to divide her time between two or more children the consequent loss in attention would show up in development, and this to some extent is borne out in the findings. The children without siblings are consistently if slightly better than those with siblings. When both housing and siblings are correlated with development the most significant intra-racial differences are discernible (Table 15). Note that in the field of adaptive behavior the quotient falls slightly below the norm (98) in the group with siblings in poor housing. This occurs in only two other Negro groups (*DQ* 99) on the first examinations of the dark-skinned and Southern

Negro Infants (Tables 12 and 14). Note also that language falls to *DQ* 94, which is the lowest score in any group, Negro or white, except the institutionalized group. That this occurs in the group living in slum housing without siblings, the writer attributes to the possibility that these infants lacked the language stimulus supplied by other children.

In the Jamaica study (12) it is noted that the children resided in a creche or day nursery. It was for this reason that the writer included as a comparative group the white infants in an institution. Group W2 shows the profound changes in and depression of development which can occur in institutionalized infants. It fully explains the poor developmental showing of the Negro infants in the Jamaica study.

It is interesting to note the rather flat and displaced character of the developmental curves in the institutionalized group in contrast to the relatively normally distributed curves of the other groups. The curve for adaptive behavior, similar to the curves in the other fields, is presented in Figure 4 by way of illustration. It is suggested that some of the institutionalized children were much more susceptible to this type of environment than others, since the scores on the first examination did not correlate with

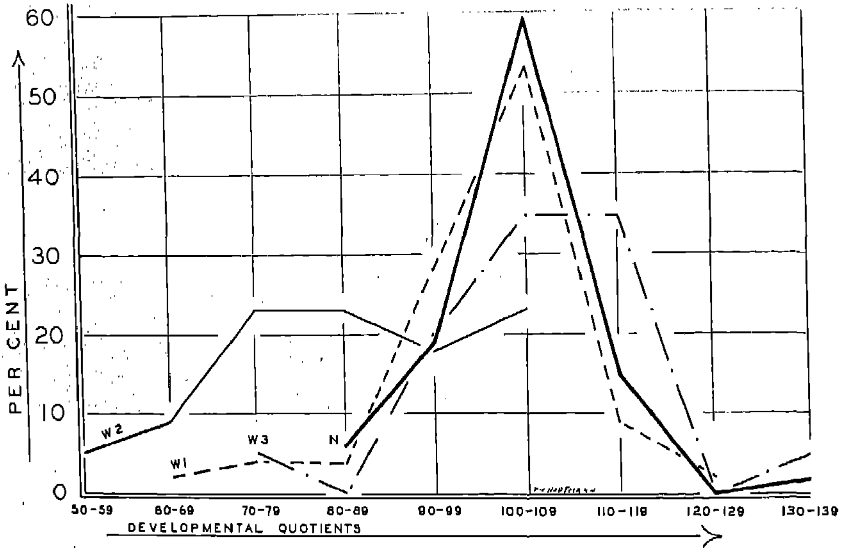

FIGURE 4
DISTRIBUTION OF DEVELOPMENTAL QUOTIENTS IN ADAPTIVE BEHAVIOR FOR NEGROES AND GROUPS W1, W2, AND W3

those obtained after individualized care. All these children, after prolonged foster home care, later came up to within the average range.

However, none of the intrinsic or extrinsic factors discussed above appear to have had an effect upon the development of the Negro group under discussion, at least not of the order of magnitude reported in other studies. The factors which would permit McGraw to say that her group of Negro babies was only about 80 per cent as mature as her group of white babies must be sought elsewhere in the environment, since the writer believes he has shown that a well-distributed group of Negro infants can be fully average.

The writer agrees with McGraw that infancy is the period of life in which extrinsic factors are of less importance than intrinsic factors in influencing behavioral development. Some of the environmental forces believed to play a rôle in development were investigated and these have been discussed with the correlated findings. One factor, however, which the writer believes played a decisive rôle in producing results at variance with the previously published studies is that of timing. This study was undertaken from June, 1944, to July, 1945, during the last year of World War II. The children involved in the study were conceived and delivered during the war years when, despite food rationing and scarcity, the Negro people, particularly in industrial communities, enjoyed a standard of living higher than they had ever had before, although possibly still below average. It must be emphasized that New Haven Negro mothers, despite or because of food rationing and scarcity, had a diet during the prenatal period which probably for the first time in American history approached or equaled the white New Haven diet.

Within the last few years a number of studies of the effect on children of certain prenatal factors have begun to appear. For instance, Gregg in Australia and now others (15) in this country have shown that rubella, contracted by the mother during the second month of pregnancy, invariably results in cataracts and other lesions in the offspring. Children thus afflicted, examined at this Clinic, have also been found to be mentally defective.

Warkany (26) showed that in rats Vitamin A deficient diets in the mothers produced deformities in the eyes of the newborn. He also proved that rats on riboflavin deficient food intake produced offspring with skeletal malformations, and postulated that riboflavin was necessary for normal embryonic differentiation. Vitamin D deficient diets, fed to the mothers, also produced skeletal deformities of another nature.

Recently in a series of "Nutrition Studies During Pregnancy" (8) in

Boston some exceedingly provocative data were assembled. The prenatal diets of 216 women were carefully evaluated for three to six months preceding delivery and graded as very poor, poor, fair, good, and excellent. The effects of prenatal nutrition were then correlated with infant mortality and morbidity. "All of the (216) cases in which the mean general dietary ratings for the prenatal period were 'excellent' or 'good' were chosen, and the condition of the infants was studied. When the infants selected on the basis of the mother's dietary rating during pregnancy are studied, it is seen that 42 per cent of the infants whose mother's diets were rated 'good' or 'excellent' were 'superior' infants, 45 per cent had only one physical count each, though of such minor importance in the majority of cases that the pediatric rating was 'good,' in other words in almost as good physical condition as those termed 'superior,' 10 per cent had two minor physical counts each, and one infant (3 per cent) had a congenital defect. In contrast, all of the (216) cases in which the dietary ratings for pregnancy were 'poor to very poor' were selected and the condition of these infants studied. It was found that 67 per cent of the infants born to mothers whose general dietary ratings were 'poor to very poor' were either stillborn, died within three days of birth, had congenital defects, were premature or 'functionally immature,' 28 per cent were considered to be in 'fair' or 'poor' general condition, and only 5 per cent were in 'good' or 'excellent' condition. . . . Actually, all but one infant born to these mothers with 'good' or 'excellent' diets during pregnancy were in 'good' condition at birth, while only two infants born to mothers with 'poor to very poor' diets during pregnancy were in 'good' condition at birth.

> Likewise, when considering birth weights and lengths of infants selected on the basis of the mother's diet, an average weight of 8 pounds 8 ounces (range 6 pounds 12 ounces to 11 pounds 7 ounces) and an average length of 20.4 inches (range 18.5 to 21.5 inches) were found for those infants whose mothers had superior diets during pregnancy. The average birth weight of the infants whose mothers' diets were rated 'poor to very poor' was 5 pounds 13 ounces (range 3 pounds 4 ounces to 8 pounds 15 ounces), and the average birth length was 18.6 inches (range 16 to 20.75 inches).

In an English study during the war, involving 5,022 mothers, in which some diets were supplemented with vitamins, the authors concluded:

> This comprehensive and controlled investigation furnishes for the first time clear evidence on questions which have long been in dispute. The demonstration of the influence of a well-regulated diet on the health of mothers and on the development and well-being of their in-

> fants is of national importance. Further, the message is addressed to all sections of the community, for it is not solely among the poorer classes that defective nutrition is prevalent. At the same time, since poverty and malnutrition march hand in hand and since the poorer classes are relatively the most fertile, it follows that the ravages of faulty maternal nourishment fall with tragic emphasis on the mothers in poor homes and their children (23).

In a similar study in Canada (16), in which the prenatal diets of 400 women with low incomes were studied, one group was left as a control, while a second group's diet was improved by supplying additional food during the last three to four months of pregnancy, and a third group, found to have moderately good prenatal diets, was improved by education alone. They concluded that "the incidence of miscarriages, still-births and premature births in the women on poor diets was much increased.

"The incidence of illness in the babies up to the age of six months and the number of deaths resulting from these illnesses were many times greater in the Poor Diet Group."

These studies strongly suggest that diet during pregnancy influences the physical condition of the infant. Developmental studies of the infants in these diet groups would have been of the utmost interest and value. However, a mere perusal of the various physical conditions found in the babies whose mothers had a poor diet leads this writer to surmise that developmental status would have been correspondingly poor in some and probably significantly depressed in others.

The writer now wishes to recall the factor of the time of this study as a variable which he believes has played a most important rôle in producing results disagreeing with previously reported studies. To repeat, the Negro mothers in this study probably received the best diets in caloric and vitamin value that they had ever enjoyed during their lifetime because of the rise in the standard of living obtained by all people in spite of wartime scarcities. Almost all these mothers received prenatal care in one or another of the clinics available in New Haven, with supervision of and instruction on prenatal diet. And finally all the infants received adequate dietary supervision during infancy, including supplementary vitamins A and D. The fact that 85 per cent of the families of this Negro community availed themselves of the public medical facilities offered in New Haven casts a sidelight upon the frequent statement that lower class individuals are too lazy or too stupid to avail themselves of medical care when it is offered them.

One of the indicators used as an index of prenatal diet has been that of birth weight and height. The birth weights of the infants of the writer's study (except for the group of females reported from Iowa—Table 5) not only exceed those of the Negroes of any of the other studies cited, but approach close to the white birth weights reported in the literature (Table 6).

When the progress in weight and height is followed and compared to Bakwin's group of Negroes (5) and of whites in moderate income families (4) it is found that not only do the New Haven Negroes surpass the New York Negro infants in weight but that the New Haven Negro females are heavier and taller than the New York white females at all ages, and that only at the nine-month mark do the New York white males catch up and pass the New Haven Negro males in both weight and height (Figures 1*a*-1*d*).

The writer thus finds it necessary to disagree with McGraw's (21) statement with regard to her investigation: "While it is possible that the nutritional factor may have a detrimental effect upon the performance of these babies, it hardly seems adequate to explain the consistent difference between white and Negro ratings at every age of the scale." McGraw's group of Negro infants was below the standards for Negroes quoted by her, in both weight and height. Her white female children were above standard in weight and height.

In the writer's study there is a small but significant difference in adaptive behavior in favor of the heavier children. Indeed, the highest average score, *DQ* 113, was obtained by the heavier group of female babies. However, since almost all the subjects probably received more or less adequate prenatal and postnatal diets and the average scores are all at or above the norms, the differences in weights between the light and heavy babies in both groups probably reflect hereditary body types more than marked variation in prenatal dietary factors.

Canady, in an article on "The Problem of Equating the Environment of Negro-White Groups for Intelligence Testing in Comparative Studies" (9), describes the difficulties in equating such groups and concludes that:

> "It would seem that the materials in this paper leave no choice but to assume that there is no basis for equating Negroes and whites by reference to similarity of environment. It is a question, therefore, whether Negro-white differences in intelligence scores can ever be changed except by such a radical change in social and economic condition of Negroes in America as shall provide comparable opportunities." He adds in a footnote, "It may be argued that since social, economic, and educational opportunities are unequal in America, the low average score made by Negroes on intelligence tests is to be regarded as a disease of society rather than evidence of group incompetence."

The writer freely admits that he has not equated the Negro-white environments in his study. On the contrary, the various groups involved remain in their respective categories. It apparently required a great war to bring the dietary and medical factors for the Negro group to a higher level. And if the old sociological dictum that "Negroes are the last to be hired and the first to be fired" is followed in the future, and certain symptoms point to this already, another opportunity for such a study may not present itself for some time to come. However, it may yet be necessary to change the norms for development with each succeeding generation of children if and when the scientific knowledge already acquired, and that yet to come, is used in the rearing of children before and after birth.

Almost all the longitudinal studies of Negro child intelligence have shown a tendency towards a lowering of average score with age. This has been variously interpreted and a certain amount of evidence has been advanced pointing to the environmental causation of this phenomenon. Others have interpreted this as a biological race difference. In this study when the first and second examinations are compared a distinct difference in favor of the older infants is found in all fields of behavior (Figures 2*a* and 2*b* and Table 7). This was also found in the analysis of both examinations in the group of white children coming from very superior homes, but was not the case with children in foster homes, whose quotients remained remarkably stable.

However, when the results for the Negroes are tabulated according to the half-year of life (Figure 5), a somewhat different picture presents itself. The average score for the second half-year of life is distinctly higher than that for the first half-year. That of the third half-year (based on only 10 cases) is slightly lower than that of the second, although still higher than that of the first. One may speculate on whether or not the third half-year is the period in which environmental forces first make themselves felt and the Negro's developmental status begins to decline. It might also be pertinent to add that a limited clinical experience with Negro children of the preschool years above infancy (apart from this study) shows sufficient evidence of poor rapport and inhibition with white examiners to require a Negro examiner in any similar study projected beyond the age ranges considered here.

The writer's personal belief is that the theory which holds that the "intelligence" of Negroes deteriorates with age is incompatible with established knowledge in genetics and the human biological sciences. The fact that a substantial number of Negroes do not deteriorate but are among our finest artists and scientists would tend to confirm this. The writer believes

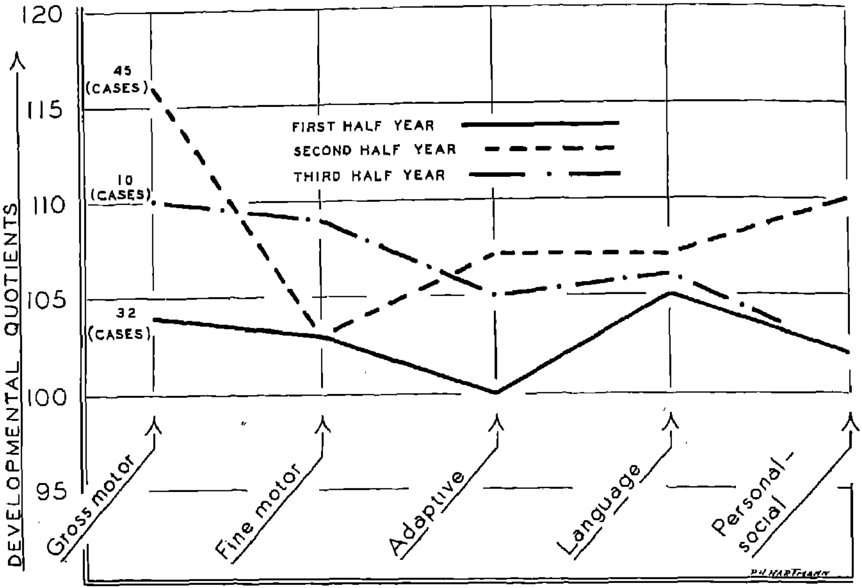

FIGURE 5
DEVELOPMENTAL QUOTIENTS OF NEGRO INFANTS IN FIVE FIELDS OF BEHAVIOR FOR THE FIRST, SECOND, AND THIRD HALF YEARS' OF LIFE

that when sufficient study is applied to the problem it will be found that extrinsic factors play the determining rôle in depressing behavior development.

The necessity for such study is great. Not only in the field of "racial" psychology but also in the investigation of man and his environment is the study of the child and his beginnings essential. The pediatrician and the public health experts have shown how the life expectancy of the race can be lengthened with improved child care. A civilization has come to be judged by the care it gives its children. The recent great war pointed up the common man who must be the ultimate recipient of the world's thought and care, not only as a means of preventing a future holocaust, but as the individual around whom a democratic civilization must revolve. And as such he is worthy of study.

To return to the article which caused such controversy in *Science,* Professor Dice (13) stated:

> Man is today the most studied of animals. He is being investigated by anthropologists, anatomists, physiologists, bacteriologists, parasitologists, pathologists, geneticists, psychologists, psychiatrists, ecologists and other specialists in many sub-branches of the broad field of biology.

> Most of these investigators are fully competent and the results of their researches are of high value. An increase in the volume of research in every one of these fields would be profitable and very desirable. I venture to suggest, however, that in addition to the studies now being made of man in each of these special divisions of science, it would be highly profitable to study also the whole man in relation to his heredity and to his environment. In making this suggestion, I am well aware that numerous investigations of man, now in progress or recently completed, involve several diverse subdivisions of biology. However, no investigation or group of investigations now in progress is, in my opinion, sufficiently comprehensive to secure anything like a complete picture of man the animal, as he exists in this constantly changing world.

The writer would like to add to Professor Dice's thoughtful statement that it is high time that a thoroughgoing attempt be made to unify and apply the vast amount of knowledge of man and his activities. This is particularly imperative in the field of psychiatry. Psychiatry is the most complex of the medical specialties, embracing as it does all of medicine and the social sciences as well.

All psychiatric schools are unanimous in placing great emphasis upon early childhood as the time when psychiatric disorders are formed or when constitutional and hereditary factors begin to show their effects. In either event, only study during this period can reveal the rôles played by exogenous or endogenous factors. It has been the writer's desire to shed a little light on a small part of this particularly vexing problem. His investigation has covered only a small but significant sector of the long life cycle. The answer to such a vital biogenetic question is to be sought also in a study of the cultural as well as biologic aspects of later childhood and adolescence. It is at this very point that a vigorous attack upon the subject might reveal some of the roots of behavior problems, school difficulties, delinquency, psychoneurosis, and the morass of psychiatric problems plaguing society.

E. CONCLUSIONS

The development of a group of 53 Negro infants (28 male, 25 female) living with their own families, was studied and compared with that of three groups of white infants; Group W1, 57 infants (25 male, 32 female), who were living in boarding homes; Group W2, 22 infants (7 males, 15 females) living in a child-caring institution; and Group W3, 20 infants (8 males, 12 female) from superior families and living at home.

1. The average New Haven Negro infant of this study is fully equal in behavioral development to the average New Haven white baby.

2. No outstanding characteristic was found which could be called a "racial" difference, with the possible exception of the definite acceleration in gross motor behavior displayed by the Negroes. In the spheres of fine motor, adaptive, language, and personal-social behavior the Negro babies did at least as well as the white children. There were no very pronounced differences in personality structure. The Negro infants, despite less favorable examination circumstances, adjusted well to examination, displaying more equanimity and restraint than white infants.

3. Female infants, both white and Negro, are slightly but significantly accelerated in development when compared to the males.

4. There are no significant correlations of development with depth of pigmentation, number of years of parental schooling, and regional origin of the parents.

5. Environmental impoverishment is shown to have a marked influence upon a group of institutionalized white children.

6. Two environmental factors correlated with development in this study, although playing significant rôles, are apparently insufficient, during infancy, to cause deficiencies in development to the degree reported in previous studies.

a. Children living in poor housing did not do as well as those living in better dwellings.

b. Children with siblings of the preschool ages, on the whole, did not do as well as infants without siblings.

7. A likely explanation for the normal developmental progress displayed by the Negroes of this study may be found in the recently reported important influence of maternal prenatal diet upon offspring. The Negro babies of this investigation were conceived and born during World War II, when the Negro people of New Haven enjoyed a diet which, for the first time, approached that of New Haven whites. This is partially reflected in the heights and weights of the Negro children, which exceeded those of any previously reported Negro group and approached the white norms.

8. The second examination of the Negro infants showed a significant advance in development. A similar advance was found in a group of white children of superior backgrounds.

9. When development is tabulated for each half-year of life, that of the second half-year is higher than the first. However, that of the third half-year, although higher than the first, is slightly lower than the second half-year. The onset of the depressing influence of exogenous factors upon Negro development might be construed as beginning during this third half-year of life.

10. The results of this study, and particularly the indication of an incipient downward trend in development, illustrate the importance of infant developmental studies as controls for the longitudinal investigations essential to scientifically planned psychologic and psychiatric research into childhood and adult problems.

REFERENCES

1. BADGER, D., & ROSS, M. R. Cultural Aspects of the Negro in New Haven. Unpublished Report, 1940.
2. BAKWIN, H. The Negro infant. *Human Biol.,* 1932, **4**, 1-33.
3. BAKWIN, H., & BAKWIN, R. M. Body build in infants: V. Anthropometry in the new born. *Human Biol.,* 1934, **6**, 612-625.
4. ———. Growth of 32 external dimensions during the first year of life. *J. Pediat.,* 1936, **8**, 177-183.
5. BAKWIN, H., & PATRICK, T. The weight of Negro infants. *J. Pediat.,* 1944, **24**, 405-407.
6. BALDWIN, B. T. Physical growth of children from birth to maturity. *Univ. Iowa Stud. Child Wel.,* 1921, **1**, No. 1. Pp. 411.
7. BROWN, F. An experimental and critical study of the intelligence of Negro and white kindergarten children. *J. Genet. Psychol.,* 1944, **65**, 161-175.
8. BURKE, B. S., BEAL, V. A., KIRKWOOD, S. B., & STUART, H. C. Nutrition studies during pregnancy. *Amer. J. Obst. & Gyn,* 1943, **46**, 38-52.
9. CANADY, H. G. The problem of equating the environment of Negro-white groups for intelligence testing in comparative studies. *J. Soc. Psychol.,* 1943, **17**, 3-15.
10. CURTI, M. W., MARSHALL, F. B., & STEGGERDA, M. The Gesell schedules applied to one-, two, and three-year-old Negro children of Jamaica, B. W. I. *J. Comp. Psychol.,* 1935, **20**, 125-156.
11. DAVENPORT, C. B. Heredity of skin color in Negro-white crosses. *Pub. Carnegie Instit.,* 1913, No. 188. Pp. 106.
12. DAVENPORT, C. B., & STEGGERDA, M. Race crossing in Jamaica. *Carnegie Inst. Washington,* 1929, No. 395. Pp. ix+516.
13. DICE, L. R. The importance of coöperative studies of the biology of man. *Science,* 1944, **99**, 457-461.
14. DUNHAM, E. C., JENSS, R. M., & CHRISTIE, A. U. A consideration of race and sex in relation to the growth and development of infants. *J. Pediat.* 1939 **14**, 156-160.
15. DUNPHY, E. B. Medical progress: Ophthalmology. *N. Eng. J. Med.,* 1945, **232**, 675-682.
16. EBLIS, J. H., TISDALL, F. F., & SCOTT, W. A. The influence of prenatal diet on the mother and child. *J. Nutrit.,* 1941, **22**, 515-526.
17. GESELL, A., & AMATRUDA, C. S. Developmental Diagnosis. New York: Hoeber, 1941. Pp. xii+447.
18. KLINEBERG, O., *Ed.* Characteristics of the American Negro. New York: Harper, 1944. Pp. xii+409.
19. ———. Race Differences. New York: Harper, 1935. Pp. ix+367.
20. Letters to *Science.*
    a. BIRCH, H. G. Science, 1945, **101**, 173-174.
    b. DANIELSON, R. N. *Science,* 1944, **100**, 246-247.
    c. GARRETT, H. E. *Science,* 1945, **101**, 16-17.

d. ———. *Science*, 1945, **101**, 404-406.
e. HERSKOVITS, M. J. *Science*, 1944, **100**, 50-51.
f. ———. *Science*, 1945, **101**, 200.
g. MONTAGU, M. F. A. *Science*, 1944, **100**, 383-384.
h. STRANDSKOV, H. H. *Science*, 1944, **100**, 146-147.
i. ———. *Science*, 1944, **100**, 570-571.
j. WEIANT, C. W. *Science*, 1945, **101**, 486.

21. MCGRAW, M. B. A comparative study of a group of Southern white and Negro infants. *Genet. Psychol. Monog.*, 1931, **10**, 1-105.
22. MICHELSON, N. Studies in the physical development of Negroes: II. Weight. *Amer. J. Phys. Anthropol.*, 1943, **1**, 289-300.
23. PEOPLE'S LEAGUE OF HEALTH, INTERIM REPORT. Nutrition of expectant and nursing mothers. *Lancet.*, 1942, **2**, 10-12.
24. PINE, K. Unpublished Thesis, 1945.
25. SCHEINFELD, A. Women and Men. New York: Harcourt, Brace, 1944. Pp. 453.
26. WARKANY, J. Congenital malformations induced by maternal nutritional deficiency. *J. Pediat.*, 1944, **26**, 476-480.
27. WARNER, R. A. New Haven Negroes—A Social History. New Haven: Yale Univ. Press, 1940. Pp. xiv+309.

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A COMPARISON OF THE STANFORD 1916 AND 1937 (FORM L) TEST RESULTS WITH THOSE FROM THE ARTHUR PERFORMANCE SCALE (FORM I) BASED ON THE SAME SUBJECTS*

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This minor study is based upon the analysis of the records of 290 cases (212 boys and 78 girls) given the 1916 Stanford-Binet and the Arthur Performance Scale, Form I, by seven different examiners connected at various times during the interval with the Mental Hygiene Clinic of the Delaware State Hospital, and by three members of the staff of the psychoeducational clinic of the Division of Special Education and Mental Hygiene of the Delaware Department of Public Instruction and the Wilmington Public Schools; and 172 cases (132 boys and 40 girls) given the 1937 Stanford-Binet (Form L) by four different examiners connected at various times with the Division of Special Education and Mental Hygiene. With the 1937 Scale, the Binet and the Arthur were administered on the same day. With the 1916 Scale the tests were given on the same day except for 58 cases: 32 less than 6 months apart; 12 from 6 to 12 months apart; 10 from 12 to 17 months apart; 2 from 18 to 23 months apart; one two years; and one three years. Most of the referrals were mentally deficient or educationally or mentally retarded children and behavior cases.

A. Correlation Data

Many correlations and intercorrelations between various kinds of verbal intelligence and psychomotor tests have been published, but few comparative studies of the results from the Binet scale and the Arthur Performance Scale have come to our attention—a rather surprising situation in view of the fact that these two batteries of tests have been in constant use in the psychological clinics for many years, and in view of the further fact that the validation of tests is still in an unsatisfactory state. It is not the purpose of this study to review exhaustively the literature directly or indirectly bearing on our major problem. The citations will be limited to some of the more immediately applicable studies.

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We find a correlation of .72 between the 1916 Binet and .53 between the 1937 Binet and the Arthur, with sigmas of .03 and .06 respectively (see Table 1). These correlations are higher than most of those between the Binet and the various performance tests reported by Porteus: .48 between the Arthur and the Binet (presumably the Stanford 1916), .59 between the Arthur and the Porteus Maze Test, and .45 between the Binet and the Maze, based on 50 delinquent children; and .54 between the Seguin and the Binet and .52 between the Kohs Block Design Test and the Binet, apparently based on 44 stable defective males, ages 14 to 35 (6). (Kohs' reported correlation of his test with the Binet was .82).

TABLE 1

COMPARISON OF BINET AND ARTHUR (FORM I) *IQ*'S

Number of cases			Pearson		Mean			Standard Deviation		
Boys	Girls	Both sexes	*r*	σ	Binet *IQ*	Arthur *IQ*	CA*	Binet	Arthur	*CA*
			1916 Binet and Arthur I							
212	78	290	.72	.03	70	73	12.4	17.4	14.2	3.28
			1937 Binet (Form L) and Arthur I							
132	40	172	.53	.06	74	82	12.7	12.9	14.8	2.31

*In terms of years.

Our coefficients are equal to those reported by Johnson and Fernow (4) between the Binet and Cornell-Coxe Performance Scale for 750 mental defectives, but lower than those for 410 epileptics. For the mental defectives their correlations range from .51 with Form M to .64 with Form L and .65 with the 1916 Binet. For the epileptics the range is from .71 with Form L to .75 with the 1916 Binet and .84 with Form M. The 1916 Binet thus gave a slightly higher correlation for the feeble-minded, and Form M a decidedly higher correlation for the epileptics. However, for the epileptics the 1916 scale correlated higher (.75) than Form L (.71).

Goodenough and Maurer's correlations between the *IQ*'s of Arthur I and the combined Stanford-Binet and Kuhlmann-Binet, based on Arthur's scattergrams for from 40 to 54 children of ages 6 to 10, vary from .54 in age 10 to .81 in age 9 (3). The examinations are based on too few cases to determine whether the age differences are of any significance.

It is not clear from our data why the 1916 Binet yields a higher correlation coefficient (by 19 points) than the 1937 Binet, nor do Johnson and Fernow's results throw any light on this point. Can it be due to the fact that the Arthur standardization was based, in part at least, on the 1916 Binet? Arthur writes:

TABLE 2

PERCENTAGE OF CASES IN WHICH THERE IS A DIFFERENCE OF LESS THAN 13 MONTHS BETWEEN THE BINET AND ARTHUR AGE LEVELS

All cases						Younger children						Older children					
Boys		Girls		Both sexes		Boys		Girls		Both sexes		Boys		Girls		Both sexes	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1916 Binet and Arthur I																	
212	59.4	78	64.1	290	60.8	96	64.6	44	70.5	140	66.4	117	54.7	33	57.6	150	55.3
1937 Binet (Form L) and Arthur I																	
132	52.3	40	37.5	172	48.8	50	54.0	16	37.5	66	50.0	82	51.2	24	37.5	106	48.1

TABLE 3

PERCENTAGE OF CASES IN WHICH THE ARTHUR AGE IS THE SAME OR HIGHER THAN THE BINET AGE

All cases						Younger children, 6-7 to 12-5						Older children, 12-6 to 17-8					
Boys		Girls		Both sexes		Boys		Girls		Both sexes		Boys		Girls		Both sexes	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1916 Binet and Arthur I																	
212	59.4	78	57.7	290	59.0	96	64.6	44	65.9	140	65.0	117	54.7	33	48.5	150	53.3
1937 Binet (Form L) and Arthur I																	
132	75.7	40	80.0	172	76.7	50	80.0	16	100.0	66	84.8	82	73.2	24	66.6	106	71.7

> In obtaining most of the Binet mental ages for the lower age groups, the Kuhlmann-Binet scale was used. For mental ages 7-15, inclusive, Kuhlmann-Binet scores and Stanford-Binet scores both were included (2). In the standardization "an effort was made to include only those subjects with Binet intelligence quotients from 75 to 125, inclusive, but this rule was not adhered to in all cases."

What is the significance of the difference? What is its bearing on the relative reliability of the 1916 and 1937 Stanford-Binet versions? These queries merit further investigation in case the finding is confirmed by other investigations.

B. EXTENT OF DIFFERENCES IN INTELLIGENCE AGE (TEST AGE) AND RELATIVE BRIGHTNESS (*IQ*) BETWEEN THE BINET AND THE ARTHUR SCALES

In terms of intelligence age, the difference, as shown in Table 2, average for both sexes, is less than 13 months for 60.8 per cent of the cases tested by the 1916 Binet and for 48.8 per cent of the cases tested by the 1937. With the younger cases the corresponding figures for the two scales are 66.4 per cent and 50.0 per cent and for the older cases 55.3 per cent and 48.1 per cent. With the 1937 Binet the difference between the younger and the older children is 1.9 per cent and with the 1916 Binet the difference amounts to 11.1 per cent.

That the difference in test ages may reach a considerable amount for some cases is indicated by the percentages of children who show differences of from less than 12 months to 84 months (Table 4).

TABLE 4

Differences	1916 Binet	1937 Binet
12 mos. or less	60.8	48.9
13 to 24 mos.	22.7	26.8
25 to 36 "	10.4	15.1
37 to 48 "	4.2	5.8
49 to 60 "	1.3	1.7
61 to 72 "	.6	.5
73 to 84 "		1.2

Extreme differences are more frequent with the 1937 Binet. With this scale, 24.3 per cent show a difference between the Binet and the Arthur of from 25 to 84 months while with the 1916 scale 16.5 per cent show a difference of from 25 to 72 months.

In terms of intelligence quotients, the differences between the Arthur and Binet are distributed as indicated in Table 5.

TABLE 5

IQ Differences	1916 Binet	1937 Binet
0-10	65.5%	57.0%
11-20	25.2%	26.7%
21-30	6.9%	12.8%
31-40	1.7%	1.7%
41-50	.7%	1.2%
51-60		.6%

The differences between the Arthur and the 1916 Binet range from 21 to 50 *IQ* points for 9.3 per cent of the cases and from 11 to 50 *IQ* points for 34.5 per cent of the cases. With the 1937 Binet 16.3 per cent show differences in the *IQ* of from 21 to 60, while 43 per cent show differences ranging from 11 to 60 *IQ* points. It is apparent that large differences in the ratings between the two scales affect a considerable number of pupils, especially when the 1937 scale is used.

What is the explanation of these extreme differences? An analysis of the data (which are not sufficiently complete to justify elaborate statistical treatments) for 49 cases that show differences of more than two years between the Binet and Arthur ratings—the most extreme divergencies—does not supply unambiguous answers. Two linguistically handicapped children (children of recent Italian and Polish immigrants) do considerably better on the Arthur than on the Binet, by 23 and 15 *IQ* points, respectively, as might be expected. On the other hand, one child with "muscular tremors" did better on the Arthur, by 24 *IQ* points, contrary to expectation, while another child with "defective powers of locomotion, marked twitches of the extended fingers, awkwardness, and clumsiness" did 21 points better on the Binet, according to expectation. One child with "considerable hearing loss" did 35 *IQ* points better on the Arthur, and another child with defective speech and suspected hearing defect did 28 points better on the Arthur, both in accordance with expectation. Of 14 children who rated from one grade to four grades lower in reading than in arithmetic (average difference two grades) 12 rated lower, in accordance with expectation, on the Binet than on the Arthur, by an average difference of 27.3 *IQ* points (Binet average 72.5, Arthur average 99.8), while two, contrary to expectation, rated higher on the Binet than on the Arthur, by an average difference of 21 *IQ*'s (Binet average 82.5, Arthur average 61.5). Of seven children who rated from one to two years higher in reading than in arithmetic (with an average difference of 1.3 grades), three rated higher on the Binet than on the Arthur, according to expectation, by an average difference of 19.7 *IQ* points (Binet average 63.7, Arthur average 44), while four rated lower on the Binet than on the Arthur, contrary to expectations, by an average difference of 28.2 *IQ* points (Binet average 59.8 and Arthur average 88). On the other hand, all children (15 cases) who obtained the same grade rating in reading and arithmetic scored lower on the Binet than on the Arthur. The average Binet *IQ* was 75.9 and the Arthur 101, a difference of 25.1 points.

Among these children for whom satisfactory data exist (36 cases), the association between low Binet and low reading scores and between high Arthur and high arithmetic scores is perceptibly positive. Thirty-three point three per cent show this relationship. On the other hand, the parallel association between the high Binet and high reading scores and low Arthur and low arithmetic scores is, curiously, not apparent. Only 8.3 per cent of the cases show this relationship. Sixteen point six per cent of the cases do not agree with either of the statements made above, 11.1 per cent having low Binet and high reading scores and 5.5 per cent having high Binet and low reading scores. The remaining 41.7 per cent have high Arthur scores and the same reading and arithmetic scores.

Eight of 11 children reported to be nervous and all except one of 14 children reported to be emotionally unstable do better on the Arthur than on the Binet. This represents the clearest generalization from our data, but it requires confirmation from a larger sampling of clinically documented data. Bijou's concept of the psychometric pattern does not seem to bear up well when applied to these cases, as shown in the final section of this study.

C. RELATIVE STATUS IN TERMS OF INTELLIGENCE QUOTIENTS AND INTELLIGENCE LEVELS (TEST AGES) BY THE BINET AND ARTHUR SCALES

The mean 1916 Binet *IQ* is three points lower than the corresponding Arthur. For the 1937 scale the corresponding difference is eight points (Table 1). With the use of the 1916 Binet, 54.1 per cent (Table 6) have a higher Arthur *IQ*, 40 per cent a higher Binet, while 5.9 per cent have the same *IQ*. With the 1937 Binet, 74.5 per cent have a higher Arthur *IQ*, 23.2 per cent a higher Binet *IQ*, while 2.3 per cent have the same *IQ* (Table 6). The 1937 Binet yields 20.4 per cent more cases with a higher Arthur *IQ* than does the 1916 Binet. The detailed distribution of the differences between the scales according to size of *IQ* interval can be gleamed from Table 6. Limiting comments to the most extreme differences between the scales, those in excess of 20 *IQ* points, it is noted that on the basis of the 1916 Binet 2.0 per cent of these extreme deviates have higher Binet *IQ*'s

TABLE 6
DISTRIBUTION OF *IQ* DIFFERENCES BETWEEN THE BINET AND THE ARTHUR INTO 10 STEP INTERVALS, SEPARATELY TABULATED FOR CASES WITH HIGHER AND LOWER ARTHUR *IQ*'S

IQ differences	No differences No.	No differences %	Arthur *IQ* Higher No.	Arthur *IQ* Higher %	Binet *IQ* Higher No.	Binet *IQ* Higher %
			1916 Scale			
0	17	5.9				
1-10			87	30.0	86	29.7
11-20			49	16.9	24	8.3
21-30			15	5.1	5	1.7
31-40			4	1.4	1	.3
41-50			2	.7		
Total		5.9		54.1		40.0
			1937 Scale			
0	4	2.3				
1-10			66	38.4	28	16.3
11-20			37	21.5	9	5.2
21-30			19	11.1	3	1.7
31-40			3	1.7		
41-50			2	1.2		
58-			1	.6		
Total		2.3		74.5		23.2

as compared with 7.2 per cent who have higher Arthur *IQ*'s. The corresponding percentages for the 1937 Binet are 1.7 per cent and 14.6 per cent. With the 1937 Binet, all who showed differences of over 30 *IQ* points had higher Arthur than Binet *IQ's*. With the 1916 Binet there is one exception, but the differences with this scale do not exceed 43 *IQ* as compared with 58 *IQ* with the 1937 Binet.

Based on differences of two years or more, 30 cases had a higher Arthur than 1916 Binet age, while the reverse was true for only nine cases. With the 1937 Binet, all who showed a difference of over two years had a higher Arthur than Binet age.

The Arthur intelligence age is as high or higher than the Binet age in the case of 59 per cent of the examinees when measured by the 1916 Binet and in the case of 76.7 per cent of the examinees when measured by the 1937 Scale (Table 3), a difference of 17.7 per cent between the two versions of the Binet.

The relative superiority on the Arthur is greater among the younger children than among the older ones. With the 1916 Binet the difference between the younger and older pupils amounts to 11.7 per cent and with the 1937 Binet to 13.1 per cent (for details see Table 3). This might be interpreted as supporting the conclusion of Goodenough and Maurer, based on the size of the standard deviations, that the Arthur scale is of questionable value beyond the normal age of 10 or 11.

Porteus reports a mean Arthur *IQ* of 84 as compared with a mean Binet of 76, based on 172 cases (type undisclosed but apparently other than those previously referred to) and a mean Maze *IQ* of 82. Based on inmates in an institution for the feeble-minded, Kinder and Hamlin found that the Pintner-Paterson *IQ*'s exceeded the Binet *IQ*'s by 10 points or more in the case of 33 per cent of the examinees while the Binet *IQ*'s exceeded the Pintner-Paterson *IQ*'s by a similar amount in the case of only 10 per cent of the cases (5). Johnson and Fernow's mean *IQ*'s were higher for the Cornell-Coxe than for the Binet in all comparisons except one, the difference between the means for the three Binet scales and the Cornell-Coxe amounting to only 1.2 points for the epileptics and 5.3 points for the feeble-minded (institutional cases).

To what extent the differences between psychomotor and verbal intelligence ages are dependent upon the particular scales of tests used, on the kinds of deviates measured, and on other factors are questions that continue to call for detailed investigation. Wallin's investigations of epileptic children (most subnormal) in 1911, e.g., showed that they reacted more slowly in the replacement of the Seguin blocks than did non-epileptic feeble-minded children of the same Binet ages, except in the higher Binet age levels (9). In such a simple group test as the crossing of *A*'s, the brightest epileptic children, in an institutional school, did only 64 per cent as well as the control squad of normal public school children (10). Epileptic children seem to suffer from psychomotor retardation. Psychomotor retardation is an outstanding defect of certain types of psychotics, particularly in the depression cycle (e.g., manic-depressives).

D. Comparative Rating by the 1916 and 1937 Binet Scales

Some of our data already presented have shown that the 1916 Binet gives a lower *IQ* than the 1937. As seen in Table 1, the difference between the means amounts to four points (the difference, however, between the Arthur *IQ*'s for the earlier and later groups is even larger, nine points).

The explanation of the difference in *IQ* points between the two scales is not immediately apparent from an examination of the data. The mean chronological ages for the two groups differ by only .3 year. Most of the 1916 Binet testing was done by the Mental Hygiene Clinic workers, while all of the 1937 Binet testing was done by the psychoeducational clinic examiners. It is difficult to evaluate the influence of this circumstance. The examiners connected with the latter clinic were under instructions to adhere strictly to uniform methods of test administration and the wide-range method of testing with all scales. Whether or not this may be a factor cannot be determined because of the unavailability of the original records from the Mental Hygiene Clinic. Possibly, lower grade cases were referred at the beginning of the program of testing, when the 1916 Binet was used (between 1932 and 1937), than during the later period covered by this study when the 1937 Binet was in use.

The above finding does not coincide with the results of a special analysis (not yet in print) of 178 mentally retarded children who were retested with the 1937 Binet at a mean interval of 33.9 months. The mean 1916 Binet *IQ* was 74.6 at the mean age of 9.3 years as compared with a mean 1937 Binet of 69.2 at the mean age of 12.4 years. Does the difference in age between the two testings account for the reversal of comparative *IQ* status? Many years ago a tendency of the *IQ* to fall with increasing chronological age was discovered and the need of a "corrective formula" was suggested (12). Does the same situation obtain with the 1937 scale although the semblance of a "corrective formula" seems to have been supplied?

Allen also found that the new Binet scales give a lower *IQ* than the original Stanford. He gives the results for 130 mentally deficient and backward inmates of an institution for the feeble-minded, ages 5.5 to 36, *IQ*'s from 25 to 89, retested at a mean interval of 5.5 years. Eighty per cent of Forms L and M *IQ*'s were lower than the 1916 *IQ*'s, some significantly so, while the *SD*'s were considerably greater for the revised Binet scale except for *IQ*'s below 50. He found no significant differences in the *IQ*'s from the two scales for subjects above age 13 at the time of the original testing (1). Rheingold and Perce, on the other hand, found that when the old divisor was used the 1916 version gave a median *IQ* 5.6 points lower than Form L but when the Form L divisor was substituted the difference was negligible (.6 points) (7). They retested 100 subnormals, *IQ*'s from 50 to 82, with the original scale within an hour or two or immediately. Identical tests were not repeated on the old scale, but were scored according to the Form L directions. Similar tests were scored according to the Form L performance. Irrespective of the pitfalls that may lurk in such administrative procedure, it becomes patent, from this brief summary from a few studies already made, that the final word has not been written on the comparative merits of the two Binet versions, at least so far as subnormals are concerned, and on the comparative reliability of the verbal and the performance types of scales.

E. Sex Differences

The tabulation of the data according to sex is limited to Tables 2 and 3. In Table 2, a larger ratio of girls than boys show a difference of less than 13 months between the verbal and performance levels for the 1916 Binet, but the exact opposite holds for the 1937 Binet. In Table 3 the boys do relatively better than the girls on the Arthur in three comparisons, and the girls do better in three comparisons also. The boys' relative superiority is confined to the older children and the girls' to the younger ones, irrespective of the Binet scale used. The difference is large enough to be significant in about half of the comparisons, the largest difference between the sexes being 20.0 per cent for the younger children and 6.6 per cent for the older cases with the 1937 scale. With the 1916 scale the difference is 1.3 per cent for the younger children and 6.2 for the older children. The peculiar sex difference here revealed requires substantiation and explanation if confirmed by further research.

F. Bijou's Psychometric Pattern

In an earlier study we found little corroborative evidence of the correctness of Bijou's claims so far as concerns test findings on the Arthur, Binet, and the reading and arithmetic tests (11). A similar conclusion is enforced by the analysis of the relevant data from these additional clinic cases, none of whom are duplicates so far as the 1916 Binet scale is concerned. Some of those tested by means of the 1937 Binet are included in the earlier study. This further analysis is limited to the 49 cases that show a difference of over two years between the Binet and the Arthur test ages, the most extreme cases. Without going into as much detail as in our earlier study, the findings may be summarized as follows: of those tested with the 1916 Binet scale, 5 (12.8%) agree with the theory, 19 (48.7%) do not, one (2.6%) is questionable, while the records are incomplete for 14 (35.9%) cases. Of the cases given the 1937 Binet, three agree (30%), five (50%) do not agree, one is questionable (10%), while the record of one case (10%) is too incomplete to justify any conclusion.

References

1. Allen, M. K. A comparison between test scores on the original and the revised Stanford-Binet Intelligence Scales administered to a group of retarded and mentally deficient subjects. *Amer. J. Men. Def.*, 1942, **46**, 501-507.

2. Arthur, G. A Point Scale of Performance Test. Vol. II, The Process of Standardization. New York: Commonwealth Fund, 1933.

3. Goodenough, F. L., & Maurer, K. M. The Mental Growth of Children from Two to Fourteen Years. Minneapolis: Univ. Minnesota Press, 1942.
4. Johnson, A. P., & Fernow, D. L. Comparison of results of Stanford-Binet and Performance Tests given at the Dixon State Hospital. *J. Psycho-Asthen.*, 1939, No. 21.
5. Kinder, E. F., & Hamlin, R. Consistency in test performance pattern of mentally subnormal subjects. *J. Psycho-Asthen.*, 1937, 132-137.
6. Porteus, S. D. The Practice of Clinical Psychology. New York: American Book, 1941.
7. Rheingold, H. L., & Perce, F. C. Comparison of ratings on the original and the revised Stanford-Binet Intelligence Scales at the borderline and mental defective levels. *J. Psycho-Asthen.*, 1939, No. 2.
8. Wallin, J. E. W. Clinical and Abnormal Psychology. Cambridge, Mass.: Houghton Mifflin, 1927.
9. ———. Experimental Studies of Mental Defectives. Baltimore: Warwick & York, 1912.
10. ———. The Measurement of Mental Traits in Normal and Epileptic School Children. Miami University Bulletin, Series XXI, No. 8, 1923.
11. Wallin, J. E. W., & Hultsch, C. L. The pathognomonic significance of psychometric patterns. *Amer. J. Men. Def.*, 1944, **48**, 269-277.
12. Wallin, J. E. W. Problems of Subnormality. New York: World Book, 1917.
13. ———. Clinical and Abnormal Psychology. Cambridge, Mass.: Houghton Mifflin, 1927.

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EXPERIMENTS ON DIMENSIONAL AND FIGURAL PROBLEMS IN THE CLAY AND PENCIL REPRODUCTIONS OF LINE FIGURES BY YOUNG CHILDREN:

I. DIMENSION

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A. INTRODUCTION

Many psychological studies exist on the subject of children's drawings, but little is known of the way in which children work from models. This study concerns itself with children's reproductions in clay, pencil drawings, and Tinker Toys. Such a project involves a two-fold problem: *perception*—how the child sees the model; and *representation*—how the child reproduces the model.[1]

Specifically, this study centers in the following questions: How will children reproduce line figures (in pencil and paper drawing and clay modelling) which suggest to the average adult either two-dimensional or three-dimensional perception? In what way will the reproduction differ from the model? How will the "two-dimensionality" or "three-dimensionality" of the drawn model influence the reproduction in a two-dimensional medium (pencil and paper) and in a three-dimensional medium (clay)? Will the shape features of the reproductions be the same as or different from those of the model? If they are changed, will the changes go in characteristic directions?[2]

There exist three types of psychological experiments relating to these problems: Experiments on questions of shape, of dimension, and of the relation between shape and dimension. In almost all studies concerned with work from models, the medium of reproduction was two-dimensional (drawing on paper, etc.). The use of this two-dimensional medium probably accounts for the fact that little has been ascertained about the dimension problem. Our use of three-dimensional media gives the children an opportunity of *making* a three-dimensional construction.

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[1] This study was made with the guidance and stimulation of Professor Max Wertheimer and Dr. Rudolf Arnheim. I am also indebted to Dr. Ernst Kris for many helpful suggestions.

[2] Shape problems will be discussed in Part II of this paper.

B. EXPERIMENTAL METHOD

The subjects, children of 5 to 7 years of age (from six schools—Ethical Culture, Community School, a public school of Brooklyn, N. Y., the Iowa University Nursery School, Lackawanna School, Stanhope, N. J., and a private non-progressive nursery school) were given clay in one set of experiments, and pencil and paper in the other set.[3] A model was held up and subjects were asked to look at it and to "make this with your clay" (or pencil and paper).

There were group and individual experiments for both the clay and drawing sets. In the group experiments, the model was held up in front of the room and the children were asked to take a good look at it. (This took from ¼ to ½ minute.) Then it was brought around to each child individually and held up for him as long as he desired (which was usually less than ½ minute). Then the model was put away with the remark that it would be held up again for anyone who wanted to see it. In the individual experiments of course, only the first step (holding it up) and the last step (taking it away with the remark that they might see it again) were necessary. (The requests to see the model after the first showing varied, from those who wanted to see it constantly to those who didn't want it at all. On the average, each child asked to see it once after the first showing. There were some differences in this respect with regard to individual models, e.g. Model I was rarely requested and Model IV was requested often.

There were 82 subjects for the main experiments (supplementary experiments included 12 subjects working with Tinker Toys and 31 subjects of other age groups). Of these, 54 took part in the clay and 46 in the pencil sets. Thus 18 participated in both sets. In most of the clay experiments, the first six models (there were 8 in all) were given to groups of four to six and the last two figures were given to each child individually at another sitting. In the drawing experiments all eight models were presented at one sitting with the subjects working in groups. This procedure was varied by having 23 subjects work individually in both clay and pencil sets.

The clay was given to the children in solid lumps (each lump about three or four inches in diameter) with no other tools available. The most usual procedure adopted spontaneously by the children was to make sticks out of the clay and then to construct the figure with them (in a few cases, the figures were carved with pencil on a flat piece of clay). Another method frequently used was to model from the solid lumps directly. In general, the children accomplished the task without difficulty with the exception of the country school house group which had had less experience with clay.[4]

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[3] In all cases the teachers claimed that the children had some experience but no training in working from models or in working in pencil or clay in any particular way. In drawing or clay periods, the children just did what they felt like doing. In the Lackawanna Country School, they were sometimes given special instructions as to what they should draw.

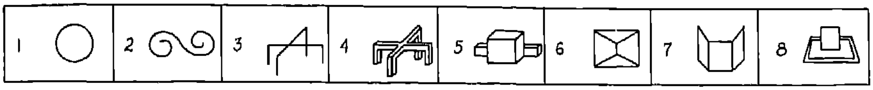

FIGURE 1

1. *Discussion of Method*

The particular models were chosen with some specific and general problems in mind (Figure 1). The general purpose was to get reproductions of various kinds of figures in the chosen mediums. More specifically, some of the model patterns chosen appeared clearly two-dimensional to the average adult: others clearly three-dimensional, and others ambiguous as to dimension.

For reproduction we chose clay (and Tinker Toys) for two reasons: (*a*) It has not, to our knowledge, been used before in such experiments and we felt that it might be useful to see whether this medium would entail a difference in results. (*b*) It offered the children an opportunity to use the third dimension and to show how they interpret "tridimensional" pencil drawings (that is, drawings which are seen by adults as tridimensional).

For an understanding of the experiments, the unique characteristics of the reproduction media must be borne in mind. Drawing is linear. Hence, the natural way to reproduce a drawn model in pencil is by lines. Here the task is relatively simple. Clay, however, is a solid substance, and is given to the children in lumps. The complication here arises from the distinction between the *line* character of the model and the *solid* character of the clay. Another difficulty arose when the subjects attempted to build three-dimensional figures out of clay sticks (difficulty in stability). The consequence of these differences of the medium will appear in the discussion of results.

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[4] For the most part, children of the Ethical Culture, reproduced the models according to the "expected solutions", both as to dimension and shape. The non-progressive nursery school and the country school house gave many solutions which we did not expect. These are the only clear cut group differences. The mere factor of group as against individual experiment did not, as far as we were able to judge, make any appreciable difference in results. The difference in atmosphere appeared mainly in that the individual child talked more about the task and was, in general, more free than the child working in the group. The progressive school children were in almost every case freer and more relaxed than the children in the public schools and the non-progressive private school.

C. Previous Work in the Field

Of all the experiments on dimension problems, Kopfermann's (5) are most relevant to this study. She investigated the conditions under which line drawings are perceived bidimensionally or tridimensionally. Although this study was not conducted with children, it is important for our problem because it tested the general psychological conditions involved in the dimensional aspects of visual patterns. Kopfermann's main conclusion is that the second or third dimension will prevail depending on which aspect offers the better, more stable structure. That is, the dimensions in which figures are perceived depend on the dimension in which the pattern makes a better gestalt. This conclusion is re-tested in our very different experimental set-up with young children. Our experiments, of course, involve not only perception of figures but also their reproduction.

Katz (3), using both two and three-dimensional models, showed that it was extremely difficult for the child to represent what it perceived as tridimensional in a plane drawing.

Volkelt (12) concluded from his reproduction experiments, that young children (in the earliest stages of graphic development) represent things much more as totalities, as wholes, than by single parts or views.

Stern (11) showed that perspective is a hindrance rather than a help to young children who are attempting to recognize objects from pictures.

There exists an extremely large literature on free drawings by children. Most of the studies are not of an experimental nature, but are reports on drawings spontaneously produced by children in daily life (1, 2, 6, 7, 8, 9, 10). Madeline Kerr applied the principle of the Goodenough test to the free drawing of houses (4) and gave statistics on the development of perspective drawing which are in agreement with the findings of other writers. From their evidence, we may conclude that hardly any children five to seven years of age, will spontaneously use side-faces in the representation of cubic objects, let alone oblique perspective lines.

D. General Problems and Concepts

On the basis of Kopfermann's (5) experiments, we would expect that some of the model figures would be understood as three-dimensional. Our experiments with adults substantiated this expectation. Did the children understand them as such? It is extremely difficult to answer this question from the pencil results. At this age, the children cannot master the technique of perspective drawing. To judge whether they understood the model three-dimensionally, we would have to interpret their "non-perspective" drawings. Even in the few cases where the perspectively drawn models were reproduced exactly by the children in pencil, we cannot be sure that they understood the model three-dimensionally; they may have been simply *copying* the model line for line. A firmer basis for answering this question is offered by the clay experiments (or Tinker Toys), for in this medium, the child has the opportunity of constructing a three-dimensional figure.

Eighteen subjects made reproductions in both clay and pencil. They confirmed our anticipated difficulty in determining from pencil drawings whether the child meant a three-dimensional or a two-dimensional figure. For example, the pencil reproduction, 38, (Figure 2) of Model III was made by children who did this figure tridimensionally in clay and by others who did it bidimensionally in clay. Similarly, children who made Model V tridimensionally or bidimensionally in clay, drew 44 (Figure 2). In some cases, had we only had the pencil reproductions to judge from, we might have thought that the subjects meant a tridimensional figure e.g., 34 (Figure 2). However, the same subjects constructed this figure bidimensionally in clay. This, of course, doesn't necessarily mean that the figure was *seen* bidimensionally.

It is necessary to define our use of the term dimension. In clay reproduction, two main kinds of dimension must be distinguished. (*a*) Clay can be manipulated in three main forms: in the form of sticks, of flat planes, or of compact (solid) bodies. Naturally, a piece of clay is always a tridimensional body. However, clay sticks, flat planes, and compact bodies clearly differ from one another in dimension. The first mentioned approximates a one-dimensional construction, the second, a two-dimensional construction, and the third, a three-dimensional construction. This category we call *material dimensions* (the way in which the material is used to form the figure). (*b*) This category concerns the way in which clay forms are used to construct the whole figure. Clay sticks, for instance, can be combined in three dimensions (as in making the frame work of a cube), or in two dimensions (as in making a square of sticks) Thus we must distinguish between two different "whole figure"-constructions, the two-dimensional and the three-dimensional. We call this category *object dimensions*.[5]

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[5] There is a group of three-dimensional solutions which cannot be characterized as having parts arranged in three dimensions. This is the case when a solid cube or ball is made. Here the figure is certainly in three dimensions but is made out of *one piece* of clay.

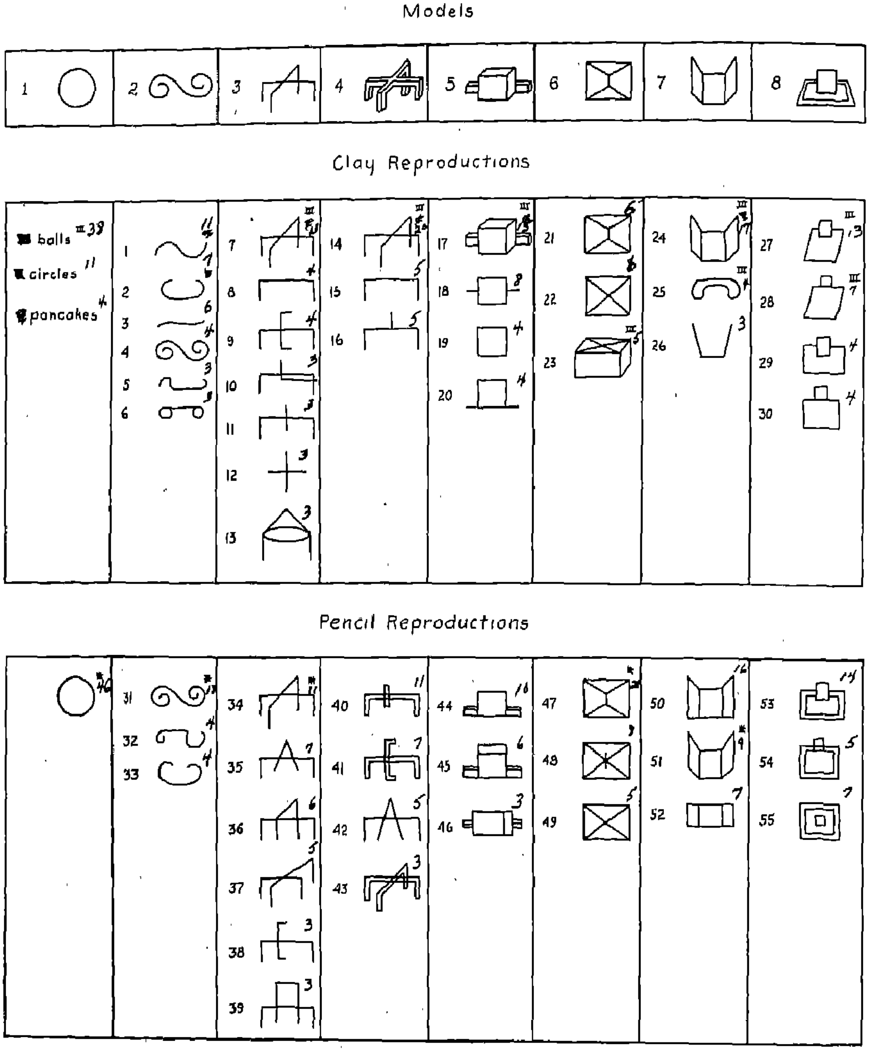

FIGURE 2
The numbers before the figures (to the left) indicate the reproduction number (to be referred to in text). The numbers to the right and above each figure indicate the absolute number of subjects who made each reproduction.

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*The figures which are starred are the faithful reproductions.

**The subjects in the pencil experiments include those who previously participated in the clay experiments as well as those who did not.

E. EXPECTATIONS AS TO MATERIAL AND OBJECT DIMENSIONS

On the basis of general gestalt rules what would we expect the dimension results to be?

Kopfermann's conclusions[6] show it will depend on the structure of a line figure, whether it is normally perceived as tridimensional, bidimensional, or ambiguous (5). Obviously, other factors than the perception of the model may also determine the dimension chosen for the reproduction. Previous training, purely technical factors, etc., may, for example, induce the child to give preference to a bidimensional solution. In spite of such limitations, it seems worth while to see whether there is a correspondence between the dimension suggested by the structure of the model and the dimension chosen by the child for reproduction in clay.

In the case of material dimensions, we have no specific rules to apply as this problem is peculiar to clay which has not been used before. However, object dimensions and shape features influence these results. A line figure will suggest reproduction by sticks which correspond to lines in the clay material. If, however, the line figure is a closed outline, as a whole or sub-wholes, then "compact" solutions, such as flat planes or round bodies, may also be expected.

Dimension is obviously related to shape. Since, however, our expectations as to shape will be given in Part II, we refer to shape here only in so far as it has immediate bearing on the dimension problem.

We will now analyze our models and see what expectations follow from this analysis. Then we will compare these expectations with the results obtained.

Model I consists of one continuous line and therefore may be reproduced by a circular clay stick (Figure 1). On the other hand, as the line forms a closed figure, "compact" solutions may also be expected, i.e., flat planes or sphere. If the reproduction is made with sticks or flats (flat plane—pancake style), we will expect it to be in one plane because the rendering of a circle by a twisted or tilted three-dimensional form, while theoretically possible, is unnatural and hard to conceive.[7]

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[6] Some characteristics of good Gestalt are analyzed in Part II of this paper.

[7] According to theories of past experience and familiarity, it might also be expected that because children have played with balls, they are less likely to see a two-dimensional figure. However, the children have also seen rings and hoops and probably have played with the latter. In general, we may say that little of this kind of "associating" with familiar objects occurred. Where it did occur, the results were still in line with structural principles. Verbal comments on the models and their connection with objects was somewhat more frequent in the private progressive schools where the atmosphere in general was much freer and encouraged individual expression.

Model II consists of one continuous line like the circle and is likely to be reproduced by a pencil line or a clay stick in many cases. The figure as a whole is not closed but the two round flanking parts approximate the closedness of a circle, for which reason each of them may in some cases be treated like Model I. This figure is similar to the circle also in so far as it represents a well-structured, stable pattern in the second dimension. Solutions in more than one plane are therefore not to be expected.

Model III is an unclosed line figure. One will, therefore, expect reproductions by clay sticks. No "compact" solutions would fit the structure of this model. In contrast to the preceding model, this one yields a better structure in the third dimension than in the second. Therefore, the expectation is that three-dimensional solutions rather than flat ones will be intended. Three-dimensionally, two "bridges" may be seen, each in itself right-angled and symmetrical, and both placed at right angles to each other. Two-dimensionally, the one bridge is a good stable structure, but the other one (in the middle) is in itself asymmetrical, contains oblique directions, and does not fit the structure of the other bridge.

Model IV would lead us to the same expectations as those of Model III. For an adult, accustomed to perspective drawing, the three-dimensionality of the model is even enhanced. The clay reproduction is again expected to be in sticks, either square-shaped or of the elementary macaroni-type.

For Model V, as for the remaining three (VI, VII, VIII) we have a situation similar to that of the circle. In these figures, we deal with drawings which, because of their linear character, might induce solutions in sticks. On the other hand, their closed or partly closed outlines are apt to suggest "compact" solutions, two-dimensional or three-dimensional, or both. This figure yields a better structure in the third dimension because the oblique lines which express depth through perspective fit into symmetrical, right-angled structures in the third dimension, but represent disturbing asymmetries and obliquities in the second dimension. However, these disturbances of the structure are less pronounced in this model. They do not impair the bidimensional structure as essentially as, for example, the oblique middle bridge in Models III and IV. Therefore, "flat" solutions may be considered as not strictly contrary to the structure of Model V. Stick and flat solutions are likely to be in one plane rather than twisted or tilted.

If the outer square of Model VI is reproduced in sticks, the interior lines will be given as sticks also. In the case of flat or cube reproductions, one would expect the interior lines to be carved in, or marked in some similar way. Stick and flat solutions are likely to be in one plane.

Model VII allows for a better structure in the third dimension: the two wings may then be given as rectangles, which are placed at right angles to the central piece. This eliminates the oblique angles and protruding corners of the bidimensional aspect. However, since the bidimensional pattern, though less stable than the tridimensional aspect, represents a symmetrical figure, bidimensional solutions will also do justice to the model. The model suggests a combination of three plane surfaces, which may be reproduced as flats or as a framework of sticks. Body-solutions, such as cubes, seem to be excluded by the model.

Model VIII, although symmetrical as a bidimensional pattern, has a better structure in the third dimension. The trapezoid may then appear as a rectangle or even a square. The interruption of the trapezoid by the little rectangle is eliminated when, in the third dimension, the pattern presents itself as one *complete* rectangle or square horizontally "on the floor" and a little rectangle (or square or cube) standing upright somewhere in the interior or even in the center, of the bottom figure. As the trapezoid has a double contour, one would expect it to be prevalently rendered as an outline of sticks. But a compact, "carpet-like" bottom figure also would not contradict the structure of the model.

Figure 3 shows the models according to expected two and three-dimensionality in ascending order.

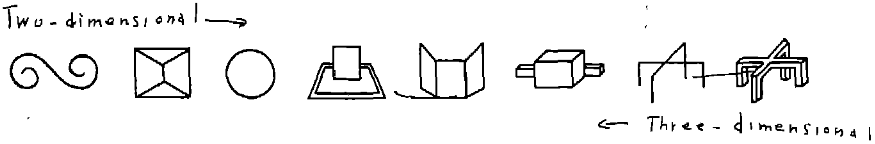

FIGURE 3
MODELS ARRANGED IN ASCENDING ORDER ACCORDING TO EXPECTED TWO AND THREE-DIMENSIONALITY

As a check on these expectations, we asked 48 adults if they thought the models were two-dimensional, three-dimensional, or if they could be either two or three-dimensional (ambiguous).

Table 1 compares these adult judgments with our best expectations (that is, our expectations of the kind of solutions which would be *most* in accordance with the structure of the figure).

Table 1 shows that in the judgment of these adults, Models III, IV, V, and VII are clearly three-dimensional; I and II are clearly two-dimensional; and VI and VIII are ambiguous (about half and half distribution of two and three dimensions).

TABLE 1
ADULT JUDGMENTS ON OBJECT DIMENSIONS COMPARED WITH BEST EXPECTATIONS
(Figures shown are in percentage)

Models	Best expectations Dimensionality Two	Three	Results Dimensionality Two	Three
I	+	+	76	24
II	+	—	75	25
III	—	+	27	73
IV	—	+	11	89
V	—	+	12	88
VI	+	+	53	47
VII	(+)	+	22	78
VIII	(+)	+	47	53

By and large, these results are in line with our expectations, except for Models I and to some extent II and III. Apparently, Model I is more two-dimensional than we thought, and Model III is not as clearly three-dimensional as we thought (as there are 27 per cent two-dimensional results). The 25 per cent three-dimensional results for Model II (which we did not consider likely) may perhaps be explained by the fact that some subjects were far away from the models and this distance made for perception of the figure something like the dumbbell solution described in our expectations. However, there may be other reasons for this which are unknown to us.[8, 9]

F. RESULTS

Figure 2 includes all results obtained from three or more children (that is, it excludes single case solutions) and is an approximate grouping. Solutions which are essentially the same are grouped together. For example, clay three-dimensional solutions of Model VII are grouped together on this chart whether the sides extended backward or forward. The small Roman Numeral III circled on the right of some figures on the clay chart, indicates that all these figures were made three-dimensionally. By visualizing them as three-dimensional, one will obtain a better idea of the constructions.

While on the whole, the results of the clay and pencil experiments are similar, in several cases we find that certain forms occur in one medium which do not occur in the other. The clay reproductions of Model II for example, are for the most part very simple shapes omitting the curlicues at the sides of the spiral. The pencil reproductions, on the other hand, are

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[8] It should be remembered that these are purely perceptive judgment, whereas the children's experiments are reproduction experiments.

[9] These experiments were conducted after the completion of the study, preventing further consideration at this time.

more elaborate and many of them contain and even exaggerate the side curlicues. If one realizes the differentiating characteristics of the two media, one can quite readily see why this should be so. It is so much simpler to make such shapes in pencil than in clay. A similar result is obtained in the reproductions of Model IV. In the clay results there are 20 reproductions which have all the structural features of the model. In the pencil results there are only three. In clay, this figure was quite simple for it was a more clearly three-dimensional drawing of Model III. If one made a three-dimensional construction in this shape, one simply made two "bridges" and placed them at right angles to each other. However, in pencil, the task was much more complex. Here the *line* character of the model stands out. Moreover, the model is constructed with triple lines drawn in perspective—something extremely difficult for children of this age to reproduce. The same thing occurs in the case of Model V.

The main differences between the clay and pencil results are due to (*a*) the respective qualities of the two media (referred to earlier) and (*b*) the relation of these qualities to the structural characteristics of the particular model.

1. *Material Dimensions*

Did the subjects build the figures of sticks, flats, or solids? First, what was the distribution of the three types of solutions for *all the figures?* If we add up the absolute figures we get: 202 Stick solutions; 46 flat solutions; 48 solid solutions; 25 combination stick-solids; 20 stick-flats; 7 solid-flats.

These results show a clear predominance of the stick solution—as anticipated in the "best expectations". The models are line drawings, and sticks are the nearest equivalent to lines.

As to the results for single models, Table 2 shows in percentages the total number of sticks, flats, solid solutions and combinations made for each model.

There is a clear-cut predominance of stick solutions for Figures II, III, IV and a slight predominance for VII. The flat solution does not prevail in any case. The solid solution clearly prevails in Figure I. Stick solutions are frequent in V, VI, and VIII, and stick-solids in V. Flats are also frequent in VII.

How do these results compare with our expectations as to material dimensions in terms of figural gestalt laws?

Table 3 indicates by plus signs what constructions would be the *best possible* solutions according to gestalt expectations.

Table 3 shows that the stick solutions were either the best or one of the

TABLE 2
MATERIAL DIMENSIONS IN THE CLAY EXPERIMENTS*
(54 subjects)
(Figures shown are in percentage)

				Combinations				
Models	Sticks	Flats	Solids	Stick-Flats	Stick-Solid	Flats-Solid	Doubtful Cases	No reproductions made
I	21	7	72	—	—	—	—	1
II	71	10	—	—	7	—	12	13
III	80	8	—	4	8	—	—	3
IV	78	4	—	8	2	—	8	3
V	44	8	—	8	30	—	10	5
VI	45	7	7	15	15	4	7	27
VII	52	38	4	2	2	2	—	6
VIII	46	11	4	15	4	11	9	8

**Combinations* are cases in which part of the figure was made of one clay form and part of the figure of another. More than one "material dimension" was used (e.g., Model V, cube with side sticks).

TABLE 3
MATERIAL DIMENSION SOLUTIONS COMPARED WITH BEST EXPECTATIONS*
(Figures shown in percentage)**

Models	Sticks	Flats	Solids	Stick-Flats	Stick-Solid	Flats-Solid
I	+21	+ 7	+72	0	0	0
II	+71	10	0	0	7	0
III	+80	8	0	4	8	0
IV	+78	4	0	8	2	8
V	+44	8	0	8	+30	0
VI	+45	7	7	+15	+15	4
VII	+52	+38	4	2	2	2
VIII	+46	11	4	+15	+ 4	11

*A plus sign next to the result indicates that this solution was a "best expectation." We use the latter instead of all the variations explained in the analysis of "expectations," for the purpose of simplification.

**In cases where the results across one line do not add up to 100, the remaining cases are either doubtful or those in which this figure was not made (compare with Table 2).

best possible solutions in every case. And, in fact, the results show a considerable number of stick solutions for each figure except Model I. For Models II, III, IV, sticks were the only expected solutions. The results of these figures clearly show stick predominance. Figure I shows a predominance of the solid solution (circle was made as a ball), whereas the prediction indicated all three solutions. The reason for the preference for the ball solution here may be that the clay was given to the child in lumps (the circle was always the first model shown) and lumps of clay lend themselves most readily to be made into round ball form.

For Model V, solid and flats-solid combinations were not expected. In fact, no such solutions were made. In addition to the stick solutions which are the most frequent, the stick-solid solution stands out. That is, the figure is given as a combination of a cube and stick. However, flats and stick-flats also were used to a certain extent.

For Model VI, stick solutions are the most prevalent, with stick-flat and stick solid solutions the next most frequent.

For Model VII, the two solutions predicted, sticks and flats, are by far the most frequent, while the solutions not predicted comprise only 12 per cent (4 out of 33 cases).

For Model VIII, the stick solution prevails, but in a small number of cases the middle rectangle was given as a flat, thus corresponding to the prediction of stick-flat. That flats would be used for the trapezoid part of the figure in some cases was expected. The results for flats and flats-solid solutions show, however, that in a considerable number of cases the children reproduced this part of the figure as a carpet-like flat surface.

2. *Object Dimensions*

How were the clay forms (material dimensions) arranged to construct the whole figure?

The total (in absolute numbers) of two-dimensional solutions was 200; the total three-dimensional was 161.

Thus the global result shows a certain predominance of the two-dimensional over the three-dimensional solutions. This may be ascribed either to the bidimensional character of the models, or as one would rather expect, to the fact that because of technical difficulties most of the two-dimensional solutions were made flat on the table.

Table 4 gives the results as to two and three-dimensionality for each individual figure.

Figures II, III, V, and VI show clear predominance of two-dimensional solutions. Figures IV, VII, VIII, show some predominance of the three-dimensional and Figure I shows a great predominance of the three-dimensional (compact—one part).[10]

How do these results compare with our expectations based on figural gestalt laws?

Table 5 compares object dimension results with best expectations.

Figure II alone lives up to the expectations in those cases where the best

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[10] There was no tendency except in a very few cases, for an individual child to consistently use a particular dimension construction for *all* figures.

TABLE 4
OBJECT DIMENSION RESULTS—TWO AND THREE DIMENSIONALITY IN THE CLAY EXPERIMENTS (in percentage)*

Models	Dimensionality Two	Three
I	28	72
II	100	0
III	67	33
IV	47	53
V	59	41
VI	69	31
VII	48	52
VIII	40	60

*Although this category is defined as the arrangement of the parts of the figure, some solutions (such as the ball for model I) are in *one part*. However, we group the one part solutions in with the others according to their two or three-dimensionality.

TABLE 5
OBJECT DIMENSION RESULTS COMPARED WITH BEST EXPECTATIONS (in percentage)

	Best expectations Dimensionality		Results Dimensionality	
Models	Two	Three	Two	Three
I	+	+	28	72
II	+	—	100	0
III	—	+	67	33
IV	—	+	47	53
V	—	+	59	41
VI	+	+	69	31
VII	(+)	+	48	52
VIII	(+)	+	40	60

solution was only one of the two possible dimensions. For Figure IV, the best solution prevails slightly, and in III the excluded solution is predominant. For Figures V and VII where both solutions are good but the three-dimensional better, we find that in the case of V there is a slight two-dimensional preference, and in VII a slight three-dimensional preference. This means that the second dimension was used more often for some models which suggest three-dimensionality, than we expected from our analysis. We think that the main reason for this is that the children made most of the two-dimensional constructions flat on the table. The results show that 169 out of 200 two-dimensional solutions were made on the table. Only 29, or 15 per cent of the bidimensional solutions were made upright. (The other two were made on the table but the subjects wanted them upright. They said that they were unable to make them stand.) Ninety-two or 57 per cent of the tridimensional solutions were made upright. (The remaining were compacts, such as balls or cubes, which cannot be considered "upright" or "flat".) If we compare all upright solutions (because only such a solution allows for three-dimensional construction) (building flat on the table a three-dimensional construction is impossible) we get 81 per cent three-dimensional results. (This percentage excludes Figure I which is expected to be two-dimensional.)

If we examine the results of the single figures from this point of view, we find that the "upright" solution are completely in agreement with what we considered best possible solutions on the basis of figural gestalt laws. Table 6 gives the results in these terms for single figures. Bidimensional solutions prevails only for Model II, the tridimensional for Models III, IV, V, VII, VIII.

TABLE 6
UPRIGHT SOLUTIONS*
(In percentage)

Models	Two-dimensional	Three-dimensional
II	100	0
III	32	68
IV	25	75
V	29	71
VII	4	96
VIII	4	96

*Models I and VI were not used in this analysis as they presented no problem.

The table solution could be due to: (*a*) technical reasons of stability (that is, the difficulty involved in making a stick figure stand up in clay). In quite a few cases the subjects actually said, "I can't make it stand so I'll have to do it on the table." In other cases the experimenter observed that the child was having difficulty and therefore put the figure flat on the table. (*b*) A carry-over of the drawing technique. (This would occur especially if the child were focused on *copying* the model, line by line.)

3. *Tinker Toy Experiments*

In order to further investigate the thesis that the table solution was the cause of the predominance of two-dimensional constructions, we changed the reproduction medium to Tinker Toys. These readily allow stick solutions to be made upright, by having little round wooden knobs with holes all around them into which sticks can be placed upright or at any angle, and three-dimensional constructions may be built. While this medium is technically somewhat more difficult than clay, and allows much less freedom for shape features, it does allow for a three-dimensional construction without the difficulty in stability.

Twelve new subjects (not included in the original clay or pencil groups) were given the Tinker Toy experiments and a week later six of them were given the pencil experiments. Tinker Toy experiments were conducted with each child individually, and Models III, (IV), V, VII, and VIII were given. (Models I and II of course could not be made with this stick medium, and VI was a little too difficult to manipulate. Model IV was given only when III was *not done* three-dimensionally.)

The total object dimension results in the Tinker Toy experiments were: 18 two-dimensional; 29 three-dimensional solutions.

Thus, the proportion of the *total* results is reversed; while the two-dimensional is dominant in clay, it is the three-dimensional in Tinker Toys. The results for the single figures are given in Table 7.

TABLE 7
TWO AND THREE-DIMENSIONALITY IN THE TINKER TOY EXPERIMENTS
(Figures shown in percentage, 12 subjects)

Models	Dimensionality* Two	Three
III	17	83
(IV)	50	50
V	36	64
VII	58	42
VIII	42	58

*Model IV was only given to the 17 per cent (2 subjects) who made Model III bidimensionally. One of the two subjects grasped the tridimensionality of the model when given Model IV.

For comparison with object dimensions in the clay experiments refer to Table 4.

In this medium we find that Figures III and V are made predominantly three-dimensional and Figures VII and VIII with almost equal distribution of both solutions. This is in agreement with our expectations. Figure VII shows a slight two-dimensional predominance, whereas a slight three-dimensional preference was expected. Some observations during experimentation suggest that there were technical difficulties involved in making this figure with Tinker Toys. In general, one could observe greater difficulty here than with the other figures, and in a few cases one could see that the subjects did not realize that the sticks could be put into the grooves at an oblique angle.

The Tinker Toy results show a predominance of the three-dimensional solutions for Models III and V, whereas the clay results were predominantly two-dimensional for these figures. The difference between the results of the two mediums for Figures VII and VIII are negligible.

4. *Experiments With Other Age Groups*

We found that the Ethical Culture students who were brighter than those of the other schools, made the greatest number of three-dimensional constructions. This pointed to the possibility suggested by Dr. Kris, that while at the 5-7 year level, it may be most natural for children to make two-dimensional constructions, we might find more three-dimensional constructions, at later age levels. With this suggestion in mind, we conducted experiments with children of different age levels.

Nine subjects, aged 8 to 9 years, were given the clay experiments. The results as to object dimensions were: 34 two-dimensional; 38 three-dimensional. (The younger children made 200 two-dimensional and 161 three-dimensional solutions. Thus, this shows a shift towards the three-dimensional. For comparison with the results of the younger children, refer to Table 4. The distribution of object dimension results for the single figures is given in Table 8.

TABLE 8
Two and Three-Dimensionality in Clay Experiments with 8-10 Year Olds: In Percentage

Models	Two-dimensional		Three-dimensional	
	8-9 years	9½-10 years	8-9 years	9½-10 years
I	33	11	67	89
II	100	100	0	0
III	78	37	22	63
IV	22	25	78	75
V	22	19	78	81
VI	67	68	33	32
VII	44	33	56	67
VIII	22	32	78	68

The 8-9 year olds show a predominance of three-dimensional solutions for Figures I, IV, V, and VIII. Figure I has fewer three-dimensional results than found in the case of the younger children and Figures IV, V, and VIII show a much greater number of three-dimensional results than found with the younger children. The results for Figure II are perfect in both groups. The results of VII are better in this group; showing a slight predominance of three-dimensional results. The solutions of Figure III, however, show even less three-dimensional construction with the 8-year-olds than with the 6-year-olds.

As a whole, there is considerable improvement as to the use of the three-dimensional construction in the 8-year-olds. However, their work still is not completely in agreement with expectations (Model III).

Next, 22 subjects aged 9½-10 were given the clay experiments. The total results were: 67 two-dimensional and 99 three-dimensional. (Compared to the youngest children's 200 two-dimensional and 161 three-dimensional results, this represents quite a large shift towards three-dimensional interpretation.)

The results for Models II, III, IV, V, VII, and VIII are in accordance with expectations.

For Models I and VI where both two-dimensional and three-dimensional constructions were in accordance with the structure of the model, we find a predominance of one of the solutions (for Model I, tridimensional; for Model VI, bidimensional).

While the models whose structure was ambiguous as to dimension (I and VI) were reproduced with a definite preference for the one or the other dimension by these age groups, the rest of the figures were certainly constructed in the best way as to the dimension expected from the structure of the model.

5. *Discussion of Results*

Just what is the meaning of this preference of the 9½ to 10 year olds for the third dimension? Did they *see* the models three-dimensionally while the younger children saw them two-dimensionally? Or is it simply evidence of an increase in abilities of reproduction (technical manipulation of the materials)? It seems to us that different kinds of experiments would have to be done to answer such questions. The point which concerns us is that while some of the dimensional results of the younger children did not measure up to expectations based on model stuctures, the solutions of the older children in this respect are just as expected.[11]

However, we must repeat that the dimensional results do not necessarily indicate that the subject *saw* the model in the particular dimension in which he reproduced it. Reproduction is a complex product into which enter (*a*) the subject's perception of the object, and (*b*) the character of the medium used in reproduction, and (*c*) the subject's ability to express what he saw in that particular medium.

G. SUMMARY AND CONCLUSIONS

Reproductions of model line figures were made by various age groups in clay, pencil drawing, and Tinker Toys. Our main interest was a comparison of the results as to two- and three-dimensionality with expectations based on figural gestalt rules. As to material dimensions the clay results were according to expectations in all age groups. As to object dimensions the clay results of the younger children differed from expectations in many respects. The clay results of the 9½ to 10 year olds and the Tinker Toy results of the younger children, were, for the most part, in good agreement with expectations based on the structure of the models.

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[11] A group of four-year-old children was also given the experiments but were unable to do them. That is, instead of working from the model, they made whatever they felt like making at the moment.

REFERENCES

1. Dix, K. W. Kőrperliche und geistige Entwicklung eines Kindes: Die Sinne. Leipzig, 1912.
2. Eng, H. Psychology of Children's Drawings. London: Kegan, 1931.
3. Katz, D. Ein Beitrag zur Kenntnis der Kinderzeichnungen. *Zeit. f. Psychol.*, 1906, **41**, 241-256.
4. Kerr, M. Children's drawings of houses. *Brit. J. Med. Psychol.*, 1936, **16**, 206-218.
5. Kopfermann, H. Psychologische Untersuchungen über die Wirkung zweidimensionaler Darstellungen Körperlicher Gebilde. *Psychol. Forsch.*, 1930, **13**, 293-364.
6. Krőtsch, W. Rhythmus und Form in der freien Kinderzeichnung. Leipzig, 1917.
7. Luquet, G. H. Les Dessins D'un Enfant. Paris, 1913.
8. Major, D. First Steps in Mental Growth. New York: Macmillan, 1906.
9. Scupin, E. G. Bubis erste Kindheit. Leipzig, 1907.
10. Stern, W. Psychology of Early Childhood up to the Sixth Year of Age. New York: Holt, 1930.
11. ———. Die Entwicklung der Raumwahrnehmung in der ersten Kindheit. *Zeit. Angew. Psychol.*, 1909, 412.
12. Volkelt, H. Bericht über den VIII Kongress für Experimentelle Psychologie in Leipzig, 1923. Jena: Fischer, 1924.

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EXPERIMENTS ON DIMENSIONAL AND FIGURAL PROBLEMS IN THE CLAY AND PENCIL REPRODUCTIONS OF LINE FIGURES BY YOUNG CHILDREN:

II. SHAPE*

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A. PREVIOUS WORK IN THE FIELD

There exists a group of studies which deals with shape problems. These show that pencil reproductions of line figures exhibit characteristic changes in the direction of increased symmetry, simplicity, etc.[1] These changes occur when the subjects have the models before them, but even greater changes are obtained when the copying is done from memory after various time intervals.

Hempstead (7), Granit (5), Lindemann (9), Allport (1), Perkins (10), and Gibson (4), using varying techniques in their reproduction experiments, find that there is a definite tendency to complete incomplete figures in reproduction, to make the figures more simple, more symmetrical, more regular, more stable, etc. Wulf and Hanawalt also emphasize changes in the reproductions in the direction of "sharpening" (exaggeration or emphasis of a characteristic or peculiarity of the given figure), and "levelling" (omission or toning down of the characteristic). Ellis points out that both of these changes are toward the Good Gestalt, and that the general law for all the changes is Wertheimer's *Law of Prägnanz* which maintains that every Gestalt becomes as "good as possible." These changes towards a "good gestalt" involve in many cases changes toward more simple, symmetrical figures.

M. Hubbell (8) conducted an investigation which was not a reproduction experiment, but rather an attempt to find out what naïve subjects consider "good" configurational properties (by having them change given figures in any way they liked which would make them better, more pleasing figures, and leave figures which they considered good, as they were). Those

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[1] Other factors, such as adaptation of the models to patterns known from past experience, or mutual influence of the models on one another, are also stressed by most authors. Under the particular conditions of our experiments (see Part I of this paper), these factors were found to play no appreciable rôle.

figures which were changed *most* were "open, asymmetrical, and irregular." The greatest number of changes were towards closure, connection and completion; elaboration, symmetry and balance; simplicity, regularity, and uniformity.

There is also an extensive literature on spontaneous drawings of children (see references Part I) which traces their developmental stages from the first scribbles to the "schema" type of representation, i.e., rendering of objects by simple forms such as circles, squares, rectangles, straight lines, triangles, etc. From the first loops, circles evolve, which serve for the representation of various objects, human beings, cars, etc. The straight line is the next acquisition. The square follows. The use of horizontal and vertical lines precedes oblique lines. Some authors also mention symmetry as an outstanding feature of children's drawings.

These findings on free drawings are corroborated by experiments on the copying of line figures. In standardizing the Binet intelligence test, it was found that the task of copying a circle and drawing a cross is successfully solved by the average three-year-old child. The average child of five is able to copy a square, whereas the ability to copy a diamond (which involves oblique lines) is not reached until the age of seven.

Bender used Wertheimer's figures as models for experiments with children of different ages, and traces the development of formal qualities in their drawings.

B. SHAPE EXPECTATIONS

Experiments and observations on the grouping of visual patterns (Wertheimer, 12, 1923) and the transformation of stimulus patterns in perception and memory experiments suggest that the shape differences between our models and the reproductions drawn or modelled by the childrn may be in the direction of improved structure. As in the case of dimensions (Part I), we will analyze our models as to their structural shape qualities and from this analysis, deduce the expected changes. Generally speaking, one would expect that a model of a good, stable structure will be less subject to change than one which is in itself either unstructured or calls for definite improvements.

The two main characteristics of Model I (see Figure 1) are its roundness and closedness. Both are structurally so strong that one would expect them to be maintained. Roundness and closedness can be expressed on paper by a circular line or disc or a ball. A circle is one integrated whole. We therefore expect one-part solutions.

Model II, though not symmetrical in the strict sense of the term, approximates a symmetry which might be sometimes completed in the solutions. The spiral line in itself is a good, continuous figure. However, it may occasionally lead to simplification by completing the two end-spirals to circles, connected by a straight line (6, Figure 2). This is a simpler figure than the double spiral. It involves a breaking up of the model into three sub-wholes. The increase of sub-wholes would, in this case, represent a structurally fitting solution, in addition to the one-part solution suggested by the consistent line of the model.

Model III is not symmetrical as a whole, but one sub-whole is—the "outer bridge." This outer bridge is a stable framework which we can expect to be maintained in many solutions. Structural trouble is produced by the inner sub-whole. This may be transformed into a pattern symmetrical in itself and with respect to the outer bridge by making it (*a*) a roof-shaped angle—a solution which would maintain the obliqueness (Reproduction No. 35, Figure 2); or (*b*) a bridge similar to the outer one—a solution which would bring further simplification by elimination of the obliqueness (Reproduction 39, Figure 2); or (*c*) even more radically, by one central vertical (Reproduction 11, Figure 2). Other possibilities of improving the structure would be (*d*) to leave out the middle piece completely (Reproduction 8, Figure 2), (*e*) to adapt the lower limit of the four verticals to each other (Reproduction 36, Figure 2), etc.

The law of good continuation (Wertheimer, 12, 1923) would suggest that the figure is to be seen as consisting of two sub-wholes, the two "bridges." Segregation of the pattern according to these two sub-wholes can be expected for most solutions. If the model is reproduced three-dimensionally in clay, one would expect two symmetrical, right-angled, equal bridges to be placed at right angles to each other.

Model IV contains the same shape features as III except for the tripled line feature. As to symmetry, the situation is similar to that of Model III. The obliqueness of the small "perspective" lines is likely to be transformed into horizontal-vertical positions. The three parallel lines which form each bar may be either simplified into one line or, at least, equalized in length. Interruptions of the lines are likely to be filled in. The segregation into two sub-wholes may be somewhat less clear and stringent in this figure than it is in Model III.

Model V has an approximate symmetry which will often be completed in the reproduction. The symmetry of the middle square is likely to be maintained. In addition to the vertical symmetry axis, a horizontal one may be acquired by lifting the two side-parts up to a central position. Again, the secondary "perspective-lines" may either be eliminated completely or equalized in length and freed from oblique angles (Reproduction 18, Figure 2). As to sub-wholes, the model certainly suggests a segregation of the central square from the rest of the figure. Thus, two-part solutions would show a stronger structural integration, but three-part solutions would also be adequate. A most radical, probably rare simplification would arise from adapting the shape of the side-pieces to the middle square so completely that one whole rectangle would result (Reproduction 19, Figure 2).

Model VI has a stable structure in its enclosing rectangle which will be maintained or improved in symmetry by being transformed into a square or cube. The interior structure of the model would be improved considerably if the small central vertical were eliminated and replaced by two diagonals (Reproductions 22 and 49, Figure 2). A further radical simplification of the structure would come about by eliminating obliqueness completely, but the oblique lines are such an integral part of the pattern that such a solution is not likely to occur often. The model is a strongly unified figure. Hence, we expect one-piece solutions.

Model VII has a vertical symmetry axis. But a horizontal axis may be added by transforming the two wings into rectangles (see Reproduction No. 52 of Model VII, Figure 2). If the central piece were changed from a rectangle to a square, the symmetry of this piece would be increased. The tendency to eliminate obliqueness will also invite a transformation of the tilted parallelograms into rectangles.

If, in clay, the figure is represented three-dimensionally, one will expect it to consist of three right-angled pieces placed at right angles to one another. The model consists of three sub-wholes so that three-part solutions can be expected. If, however, the two wings become rectangles, then the whole pattern assumes the shape of one horizontal rectangle—a one-piece solution.

Model VIII has a vertical symmetry axis and therefore has a certain amount of stability. The symmetry could be increased only if the trapezoid were transformed into a rectangle or even a square, and if the small part, rather than overlapping the larger one, were placed in the center of the larger pattern. This would represent a strong figural simplification. Doing away with the obliqueness would also involve making the double contour lines of the original trapezoid parallel and giving them equal width throughout. Further simplification may lead to an elimination of this structurally unessential doubling of the contour. If, in clay, the model is given tridimensionally, one would expect the trapezoid to become a right-angled, horizontal "floor" figure with the little square (or cube) standing upright in its center. The model clearly consists of two sub-wholes. Two-piece solutions are therefore to be expected.

C. SHAPE RESULTS

In turning to the shape results, we confront the question of the extent and the way the pencil and clay reproductions differ from the models. In this connection, the following facts must be borne in mind.

Limitations of manual ability and similar factors will prevent the child from producing not only a geometrically exact copy of the model, but also perfect realization of what he "intends" to draw. Furthermore, it may not be the intention of the child to give a geometrically exact copy. In fact, experiences with the drawings of children show that generally they are satisfied with rendering the general, approximate characteristics of a shape. This raises the following problem: since a psychological study is concerned with what the child *meant* to do, how are we to evaluate our results, when we, abandon the criterion of geometrical exactness?

The child's drawing of a circle will not be a geometrically perfect circle.[2] But in almost every case it can be decided with reasonable certainty whether the child intended to make a circle or, instead, an oval or a square. Our evaluations of the results are limited to global distinctions (rather than fine shades of differences such as length or straightness of line) between the model and the reproduction. For this purpose most of the reproductions were sufficiently unambiguous. Wherever the general direction of a change (e.g., from an unsymmetrical to a symmetrical pattern or from an oblique line to a vertical) was not clear-cut, the case was classified as doubtful.

1. *Faithful Reproductions*

In how many cases did the children reproduce all essential characteristics in accordance with the model? (This would mean, e.g., in the case of Model VII that the child's drawing will have an upright rectangle flanked by two equal oblique parallelograms pointing upward.)

Table 10 shows that out of a total of 248 drawings, 88 or 35 per cent were faithful reproductions. More significant than this global result, how-

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[2] The Merrill Palmer pre-school *IQ* test and the Stanford Binet *IQ* test, set the age of three as the time that the child is able to reproduce a circle. At this age, the child is simply required to achieve a rotary motion. In general, however, these tests are graded according to the accuracy of detail (straightness of line, etc.) rather than the grasping of the more general essential structural characteristics. It is the latter we are especially concerned with.

TABLE 10
FAITHFUL PENCIL REPRODUCTIONS
(46 subjects—absolute numbers)

Model	Faithful	Not faithful	Doubtful	No drawing made
I	46	0	0	0
II	18	26	0	2
III	11	33	0	2
IV	0	39	0	7
V	2	44	0	0
VI	21	25	0	0
VII	9	37	0	0
VIII	1	45	0	0

ever, is the extreme differences for the models individually. The results vary from 100 per cent faithful reproductions (Model 1) to 0 (Model 4). Are these variations accidental or can they be explained from the structure of the models?

To answer this question, we must first examine the results of the clay experiments. Here we have a peculiar problem presented to us. The evaluation presents little difficulty as long as the child reproduces the model by a two-dimensional pattern (for the model is two-dimensional). But what about three-dimensional reproductions? One might be inclined to call such solutions faithful if they give the object of which the model presents a perspective representation. But the fact that the child used the third dimension for reproduction rather than the second itself represents a remarkable change from the model. This change must be considered an improvement of shape for, according to gestalt theory of depth effect (Kopfermann), three-dimensional perception is chosen when and because it represents the better-structured pattern. For that reason, we compare in the clay experiments, the shape characteristics of the model, *as a bidimensional pattern* with those of the reproduction, considering it e.g., an improvement, if Model III is reproduced as a three-dimensional figure of two identical, rectangular bridges.

But a second problem presents itself. Even when we compare the *three-dimensional* aspect of the model with the three-dimensional reproduction in clay, it is not simply "faithful" reproduction when for instance in Model VIII, the "bottom" figure is reproduced as a rectangle.

A perspective drawing is equivocal as to important characteristics of the model represented. Are, in Model VII, the wings at right angles to the central rectangle? Is, in Model VIII, the "bottom" figure a square, a rectangle, or a trapezoid? The laws of perspective give no answer to this question. If Model VII is reproduced with right angles and Model VIII with a bottom square or rectangle, we already have a transformation towards improved structure.[3] For this reason, we may consider only the two-dimensional clay solutions as faithful reproductions. This, of course, means that the results of the pencil and clay experiments will not be comparable, for in the clay experiments we consider only a part of the results, the two-dimensional solutions). This part of the clay results contains faithful reproduction for only four of the models. In the case of Model I, we find 14 faithful reproductions (this is 14 out of 15 two-dimensional solutions). For Model II there is one faithful reproduction (1 out of 41 two-dimensional solutions); and in the case of Figure VII we find two cases of faithful reproductions (that is, two out of 23 two-dimensional reproductions). Model VI is reproduced faithfully in five cases (out of 18 two-dimensional solutions). Can the results as to faith-reproductions be explained by the structure of the models? One might expect that the "better" the structure of a figure, the less susceptible it will be to changes. We may divide our models roughly into three groups as to the "goodness" of their structure. Figures I and VI are strongly symmetrical, simple patterns. Figures II, VII, and VIII introduce some complication: the curves and lack of symmetry in II, the slanted lines in VII, the overlapping in VIII. Figures III, IV, and V would be regarded structurally even less "good," if they are considered as two-dimensional patterns; lack of symmetry, complex arrangements of slanted lines, etc., may be cited here. If this analysis is correct, one would expect the greatest number of faithful reproductions in the first group, the smallest number of changes in the third. Actually, the results for the pencil experiments show: Group I (Figure I—46, Figure VI—21) 33 faithful reproductions; Group II (Figure II—18, Figure VII—21, Figure VIII-1) 13 faithful reproductions; Group III (Figure III—11, Figure IV—0, Figure V—2) four faithful reproductions.

Thus, the results are exactly in the direction expected for the groups, and also for single figures, with the exception of VIII (too few faithful reproductions), and III (too many faithful reproductions). Figure VIII, although symmetrical, is intricate in detail and therefore makes faithful reproduction difficult. Figure III, however, while not symmetrical, is a simple pattern of "two lines" only. If we look at each figure individually, we see that the one essential characteristic, e.g., the roundness of the cricle, is structurally so strong that changes are unlikely. In fact, we obtained 100 per cent faithful solutions from this model. On the other hand Model VIII seems strongly to invite changes such as elimination of overlapping and transformation of the trapezoid into a rectangle or square. In fact, only 1 per cent of the reproductions of Model VIII were faithful. We have no faithful reproductions for Figure IV. Here the reason is probably the difficulty of the figure made with triple lines in perspective aspect. Hence, the hypothesis seems admissible that the varying number of faithful reproductions is related to the degree to which the single models invite improvement of structure (or as in one case, Figure IV, because of the complexity of the model).

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[3] These psychological aspects of perspective are discussed in a forthcoming study by R. Arnheim.

2. *Shape Changes*

What kinds of changes were made in the results which were not "faithful" reproductions? Do the changes go in definite directions or are they spread in a completely accidental way?

From our expectations one would anticipate that the changes would be in the direction of better structure. For this reason, we will evaluate the results as to a few pronounced features of this kind. Namely: (*a*) increase in symmetry, (*b*) increase in parallels and right angles, (*c*) decrease in sub-wholes and parts of sub-wholes.

a. Symmetry. Were the reproductions less symmetrical, more symmetrical than the model, or did they have the same amount of symmetry? We define symmetry geometrically, by the number of symmetry axes in the figure. A circle, for example, has an infinite number of symmetry axes; a square has four symmetry axes (horizontal, vertical, and two diagonals); a rectangle has two axes of symmetry (horizontal, vertical) and figures such as our Models VII and VIII have one axis of symmetry.

We should also mention symmetry of parts of the figures. For example, Model VIII as a whole has only one axis of symmetry. However, the small rectangle in this figure has two axes of symmetry.

Relating to symmetry of the whole figure, our models are as follows: Model I has an infinite number of axes; Models II,[4] III, IV, V, have none; Model VI has two; Models VII and VIII have one.

As to symmetry of *parts* of the figure, Model III contains one sub-whole (the "bridge-like" part) which has one axis of symmetry; Model V has a rectangle within it which has two axes of symmetry; Model VII also has a rectangle within it (two symmetry axes) and VIII has the same.[5] Thus, we determine whether or not the reproductions are more, less or equally symmetrical with the model, by the number of symmetry axes in the reproduction as compared with the number of symmetry axes in the model.[6]

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[4] Although Model II is not symmetrical in the strict sense it has a kind of symmetry.
[5] In the equal symmetry group, the faithful reproductions will be included.

Figure 4 gives a few typical examples in which the results show increased symmetry of the whole figure.

Table 11 gives the results of the pencil experiments as to symmetry of the whole figure.

TABLE 11
SYMMETRY IN THE PENCIL EXPERIMENTS
(Percentage)

Model	Symmetry increased	Decreased	Equal
I	0	0	100
II	21	0	79
III	27	0	73
IV	49	0	51
V	65	0	35
VI	19	11	70
VII	17	7	76
VIII	13	15	72

Figures IV and V show a marked change towards increased symmetry. Figures I, II, III, VI, VII, VIII, for the most part, maintain equal symmetry. In no figure is there a large change toward decreased symmetry; the largest being 15 per cent for Figure VIII.[7]

However, even where the symmetry of the whole figure was equal or decreased there were still 40 cases in which it was increased as to single parts. Of these 40 cases in which we find increased symmetry of parts of the figure, 24 were solutions of Figure VIII. In the latter solutions, the trapezoid of the figure was changed to a square of rectangle, which of course increased the number of symmetry axes for that part of the figure, while maintaining equal symmetry for the whole. These 24 solutions represent 52 per cent of the total solutions for Figure VIII.

In 40 cases, we have increased symmetry for parts. The largest percentage maintain equal symmetry. Only 4 per cent show decreased symmetry.

Obviously, these results must be considered in relation to the amount of symmetry in the models. We cannot call a result negative when, as in Figure I, there is no increase of symmetry at all, for the simple reason that the circle already contains the greatest possible amount of symmetry.

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[6] Model IV has one part (bridge-like part) symmetrical only when it is seen three-dimensionally.

[7] The changes to decreased symmetry in Models VI and VII were largely due to motor difficulties (crooked lines). In a few cases, the structure of the model wasn't grasped.

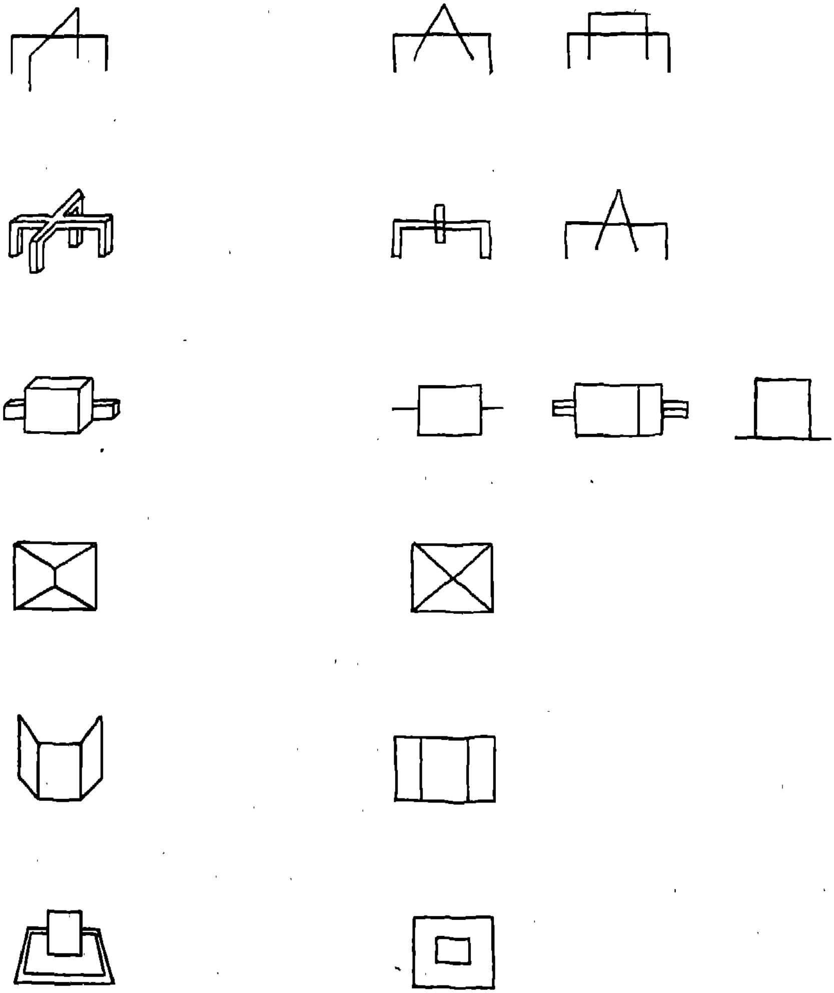

FIGURE 4
SOME TYPICAL REPRODUCTIONS WHICH SHOW INCREASED SYMMETRY OF THE WHOLE FIGURE

Table 12 shows the number of symmetry axes in the model compared with results of the pencil experiments.

The chart shows that, roughly, the amount of increased symmetry in the reproductions decreases with increasing symmetry in the model.[8] In

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[8] We would also expect increased symmetry as to *parts* in Figures III, IV, V,

TABLE 12
COMPARISON OF MODEL SYMMETRY WITH RESULT SYMMETRY IN PENCIL EXPERIMENTS

Number of symmetry axes	Figure numbers	Increased symmetry in percentage of cases	Group average
0	II	21	
	III	27	40
	IV	49	
	V	65	
1	VII	17	15
	VIII	13	
2	VI	19	19
Infinite	I	0	0

TABLE 13
SYMMETRY IN THE CLAY EXPERIMENTS
(Percentage)

Model	Symmetry increased	Decreased	Equal
I	0	0	100
II	49	0	51
III	74	0	26
IV	90	0	10
V	92	0	8
VI	55	15	30
VII	46	12	42
VIII	22	6	72

the first group, where the best opportunity for changes was offered, symmetry increased in an average of 40 per cent of the cases. (Correspondingly, the number of cases in which the amount of symmetry remains unchanged decreases with decreasing symmetry of the model).

The results of the clay experiments as to symmetry of the whole figure are given in Table 13.[9]

Figures II, III, IV, V, VI, and VII show a marked change towards increased symmetry. Figures I and VIII maintain equal symmetry.

There was also an increase of symmetry of *parts* in 45 out of the total results in which the symmetry of the figure as a whole had not changed or

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VII, VIII, and the results do show a slight tendency for this to occur in III, IV, VII, and a very great tendency in Figure VIII.

[9] The 15 per cent decrease in symmetry shown for Model VI represents four out of 27 cases. Of these, three did not grasp the model at all, and the fourth grasped the square but not the inner lines.

The 12 per cent decrease for Model VII represents seven cases out of 48 in all of which the model was not grasped.

decreased. (Of these, 30 out of the 45 cases were solutions for Figure VIII—being the same kind of changes made in the experiments for this figure.)

When we compare these results to the amount of symmetry in the model, we find again that the largest increase in symmetry occurs in the group of models which has no symmetry axes at all. This increase amounts to an average of 76 per cent in all cases. Table 14 compares the symmetry axes of the model with these symmetry results.

TABLE 14
COMPARISON OF MODEL SYMMETRY WITH RESULT SYMMETRY IN CLAY EXPERIMENTS

Number of symmetry axes	Figure numbers	Increased symmetry in percentage of cases	Group average
	II	49	
0	III	74	76
	IV	90	
	V	92	
1	VII	46	34
	VIII	22	34
2	VI	55	55
Infinite	I	0	0

The results again show the increase of symmetry relative to the amount of symmetry in the model (with the exception of Model VI where there is greater increase in symmetry than we might expect. Here, the center lines were changed to crossing diagonals (see reproductions 22 and 49 of Figure VI on Chart II) thus adding two more axes of symmetry).

If we compare the pencil results with the clay results as to increased symmetry, we find that the increase in symmetry is much more considerable in the clay experiments. In the group of models with no symmetry axes, we have an average increase of 40 per cent in pencil as against 76 per cent in clay, and in the other groups, the increase is even more pronounced. Why do we find this large difference? There seem to be several reasons. (*a*) In pencil reproduction, there is a greater tendency to *copy* the model line by line. (Copying exactly, would, of course, make for less change.) Clay on the other hand, being a different medium from that of the model, with definite characteristics of its own, tends to encourage deviations from the model. (*b*) Clay is a more difficult medium to work with. This may account, to some extent, for the fact that the figures were made more simply and symmetrically in this medium. Still another possible reason might enter in for those clay solutions which were made in the third dimension. Such figures as V, IV, and III, seem to allow an increase of symmetry much more simply in the third dimension than in the second. This may lead to an advantage of the clay technique over the pencil technique which does not allow three-dimensional solutions. If, however, to test this hypothesis, we examine the results to see what percentage of two-dimensional clay solutions and what percentage of three-dimensional was more symmetrical, we find no appreciable difference in the two cases. In every case, there is a slight preference for symmetry in the three-dimensional solution, but only in the case of Figure VII is there a great preference for symmetry in the three-dimensional as against the two-dimensional solutions.

b. Parallels and right angles. A further factor in improved structure consists in changes from non-parallel lines to parallel lines and from oblique angles to right angles. There may be cases where only one or two of such improvements are made in the reproduction of a particular figure, while other non-parallel lines and non-right angles, are not changed. Or there may even be changes going in the opposite direction (some changes towards improvement of structure and some towards making the structure worse). To simplify the evaluation of this factor, we include in Table 15 only those cases in which *all* non-parallel lines and oblique angles have been changed to parallel lines and right angles (Figure 5).[10] Thus, we are excluding all cases in which only partial improvements were made.

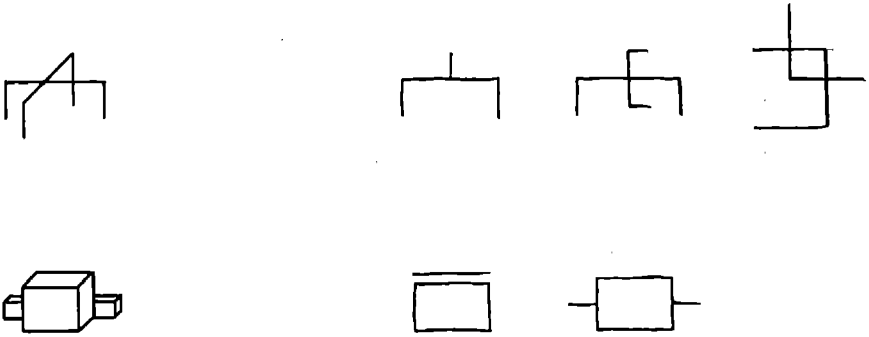

FIGURE 5
SOME TYPICAL CASES IN WHICH ALL NON-PARALLEL LINES AND NON-RIGHT ANGLES IN THE MODEL HAVE BEEN CHANGED INTO PARALLEL LINES AND RIGHT ANGLES IN THE REPRODUCTION

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[10] I must repeat that it is, of course, very hard to differentiate with absolute exactness between right angles and non-right angles, etc. Judgments were made on the basis of whether or not a right angle seemed to have been intended.

TABLE 15

CHANGES TO AND FROM PARALLEL LINES AND RIGHT ANGLES IN THE PENCIL EXPERIMENTS (Percentage)

Model	All non-parallels and non-right angles changed to parallels and right angles	Any parallel line and right angle changed to a non-parallel line and non-right angle
III	25	23
IV	58	19
V	72	2
VI	4	11
VII	22	9
VIII	78	4

We compare on Table 15 cases in which *all* non-parallels and non-right angles were changed to parallels and right angles,[11] with those cases in which *any* parallel line and right angle was changed to a non-parallel line and non-right angle.

The average change from all non-parallels and non-right angles to parallels and right angles was 43 per cent, whereas in only 11 per cent of the cases was *any* parallel line or right angle changed to a non-parallel line or non-right angle.

Figures IV, V, VIII show a marked predominance of parallels and right angles. Figure III shows almost as many changes to non-parallels and non-right angles as to parallels and right angles. In Figure VI, the 11 per cent change to non-parallels and non-right angles represents three cases (probably due to motor difficulties but grouped here anyway).

To understand the results of the chart wherein we have 78 per cent increase of parallels and right angles for Figure VIII, and 4 per cent for Figure VI, one must look at the structure of the model. In Figure VI, the diagonal lines and oblique angles are essential and good parts of the structure. Therefore, they do not call for improvement in the direction of parallels and right angles. On the other hand, in Figure VIII, the slanted lines of the outer figure are not essential to its structure. Actually, the figure is improved by the change to parallel lines (thus making the trapezoid a square or rectangle). The same holds for Figures IV and V. We would also expect the same to be true of Figure III, but it is not.

While Figure IV has the same structure as Figure III, it is made so complex by the triple lines that the likelihood of their changing it is greater. In the case of Figure VII, the slanted lines are not disturbing parts of the structure if it is taken bidimensionally, and therefore one would not expect a great tendency to change them in the pencil experiments.

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[11] Figures I and II are left out of Table 15 because they are curved figures and therefore are not involved in the question of parallel lines and right angles.

Table 16 gives the results on parallel lines and right angles for the clay experiments.

TABLE 16

CHANGES TO AND FROM PARALLEL LINES AND RIGHT ANGLES IN THE CLAY EXPERIMENTS (Percentage)

Model	All non-parallels and non-right angles changed to parallels and right angles	Any parallel line and right angle changed to a non-parallel line and non-right angle
III	59	12
IV	80	2
V	84	2
VI	4	12
VII	48	21
VIII	81	2

The average result of all non-parallels and non-right angles changed to parallels and right angles in the clay experiments is 59 per cent, whereas in only 9 per cent of the cases was any parallel or right angle changed to a non-parallel or non-right angle. Thus, again we find the clay has more changes than the pencil experiments.

Figures III, IV, V, VII, VIII, show marked changes towards all parallel lines and right angles. Only Figure VI does not, for the same reason that it did not in the pencil experiments.

The larger percentage in parallel lines in the clay experiments seems again to be due to the difference in materials.

c. Sub-wholes. Do the reproductions have less, more, or an equal number of sub-wholes as the model? E.g., Figure III has two sub-wholes, reproduction No. 8 of Figure III on Figure 2, has one sub-whole. The sub-wholes can also be subdivided into their single lines (parts of sub-wholes); e.g., Reproduction 18 of Model V on Figure 2, has fewer lines in each sub-whole than does the model. Similarly in Reproductions 16 and 42 of Model III.

A decrease in the number of sub-wholes and parts of sub-wholes we would consider to be mostly a change in the direction of simplicity. An increase in the number of sub-wholes and parts of sub-wholes we would consider to be mostly a change in the direction of complexity. There are, however exceptions to this.

For instance, taking away one of the side sticks of Figure V would damage rather than improve the structure. Conversely, breaking Figure II down into a dumbell-like pattern (Reproduction 6 Figure 2), might be called an improvement of structure through increase of sub-wholes. But, by and large, we can use a decrease of sub-wholes as a convenient indicator structural improvement. Decrease of number of *parts* of sub-wholes in particular, is likely to produce better structure because such change allows the maintenance of the essential characteristics of the figure, while also allowing for the doing away with asymmetries, non-parallel lines, etc., e.g., Reproduction 30 of Figure VIII, Figure 2. This model has five lines in the trapezoid sub-whole, while the reproduction has only four lines.

Table 17 shows the results of the pencil experiments as to number of sub-wholes and parts of sub-wholes.

TABLE 17
NUMBER OF SUB-WHOLES AND PARTS OF SUB-WHOLES IN THE PENCIL EXPERIMENTS
(Percentage)

	Sub-wholes				Parts of sub-wholes			
Model	Less	More	Equal	Doubtful	Less	More	Equal	Doubtful
I	0	0	100	0	0	0	0	0
II	0	2	86	12	0	0	0	0
III	0	2	94	4	25	4	71	0
IV	5	0	88	7	47	5	43	5
V	4	13	83	0	84	4	12	0
VI	0	0	100	0	37	8	55	0
VII	8	0	88	4	17	4	77	2
VIII	4	4	90	2	67	4	29	0

For the most part, the number of sub-wholes is equal to that of the model, which is in line with expectations. As to parts of sub-wholes, however, we have quite different results. Here, Figures IV, V, VIII show marked decrease in parts. In Figures III, VI, VII, the same number of parts is maintained in the greatest percentage of cases. In no case is there a marked increase of parts, and therefore no trend towards complexity, but a trend towards simplicity.

Table 18 shows the results of the clay experiments as to number of sub-wholes and parts of sub-wholes.

The number of sub-wholes is for the most part equal to that of the model. The largest *decrease* is for Figures V (35 per cent) and VII. Figure V, when seen bidimensionally, is quite complex and asymmetrical; hence, we expect a tendency to simplify it. The largest *increase* is for Figure II (12 per cent) which does not actually represent a change to complexity, but rather a good change, e.g., dumbell solution. An increase in sub-wholes does not necessarily mean making a figure poorer.

TABLE 18
NUMBER OF SUB-WHOLES AND PARTS OF SUB-WHOLES IN THE CLAY EXPERIMENTS
(Percentage)

	Sub-wholes				Parts of sub-wholes			
Model	Less	More	Equal	Doubtful	Less	More	Equal	Doubtful
I	0	0	100	0	0	0	0	0
II	0	12	88	0	0	0	0	0
III	14	2	78	6	47	0	47	6
IV	12	4	82	2	29	4	55	12
V	35	4	59	2	57	2	39	2
VI	0	4	96	0	43	25	29	3
VII	35	0	63	2	42	8	48	2
VIII	9	2	87	2	83	2	13	2

As to parts of sub-wholes, we find that for Figures III, V, VI, VII, and VIII, there is a marked decrease in the number of parts (especially in Figure VIII where the outer figure is almost always made into a completed square or rectangle thereby decreasing the lines of that sub-whole). Figure IV shows a decrease of 29 per cent. The next highest figures are in the column of equal number of parts. In all cases, except Figure VI, we have very little increase (except 2 per cent to 8 per cent). In Figure VI (where we only have 27 clay results), seven cases (25 per cent) were reproduced as cubes and therefore there was, according to our strict definition, an increase in parts. However, this reproduction in cubes is not really a change toward complexity but simply a result of the material factor.

Thus, there is almost no trend towards increased complexity. As to number of parts of sub-wholes (and to a small degree as to sub-wholes), we have a marked trend towards decrease, or towards simplicity.

The same trends are found in the pencil and clay results, with average changes being somewhat greater in the clay experiments for the same reason that changes in clay are greater for all the categories.

In some cases, there is also simplification of outline and contour which is not covered by this grouping A few such cases are shown in Figure 6.

3. *Experiments with Other Age Groups*

While our main concern in conducting the experiments with older children was dimension, we will briefly refer to the shape characteristics of their work.

There was some increase in faithful reproduction in the work of the 8- to 9-year-olds, but on the whole the shape characteristics of their work did not differ radically from those of the younger children. The 9½-year to 10-year-olds, however, reproduced a good many figures either faithfully

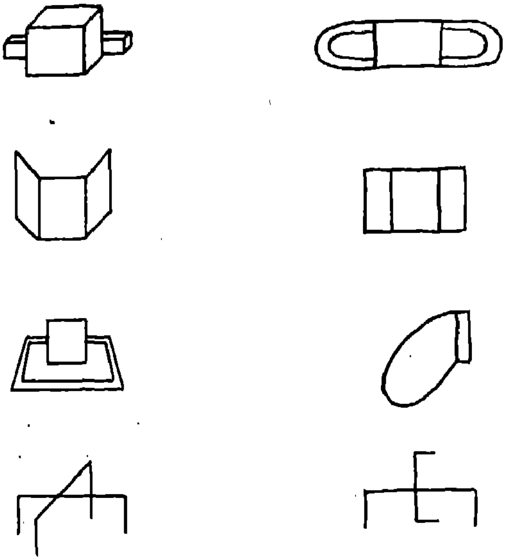

FIGURE 6
Some Cases of Simplification of Outline and Contour

or nearly faithfully. This increase in faithful reproductions was mainly for Figures II, VI, and VII (II was made faithfully by almost all the older subjects). Shape changes were largely for Figures III, IV, V, VIII, and they went in the same direction as did the changes of the young children.

D. Summary and Concluding Remarks

From the results as to two and three-dimensionality (Part I), faithful reproductions, changes toward improved structure (increase in symmetry, parallels and right angles, and decrease in sub-wholes and parts of sub-wholes), we feel that the general statement may be made that the results show grasp of the visual patterns presented and a tendency to improve the structure wherever possible. The differences which occur between models and reproductions can be traced to this general tendency rather than to haphazard, irregular mistakes due to mere mechanical inability in copying. The sphere of the individual personality enters into the *particular* change made. A single model may be changed in many structurally reasonable ways. The specific manner in which a particular child changes a figure will probably have some relation to the kind of personality the child has. We refer to Dr. Bender's (2) important contributions in this field.

REFERENCES

1. ALLPORT, G. W. Change and decay in the visual memory image. *Brit. J. Psychol.*, 1930, **21**, 133-148.
2. BENDER, L. A visual motor gestalt test and its clinical use. *Research Monographs,* No. 8 Orthopsychiatric Assoc.

2a. ———. Disturbances in vasuomotor gestalt function in organic brain disease. *Arch. Neurol. Psychiat.*, 1933, **30**, 514-537.

2b. ———. Gestalt principles in the sidewalk drawings and games of children. *J. Genet. Psychol.*, 1932, **41**, 192-210.

3. ELLIS, W. D. A Source Book of Gestalt Psychology. New York: Harcourt Brace, 1939.
4. GIBSON, J. J. The reproduction of visually perceived forms. *J. Exper. Psychol.*, 1929, **12**, 1-39.
5. GRANIT, A. R. A study in the perception of form. *Brit. J. Psychol.*, 1921, **12**, 223-247.
6. HANAWALT, N. G. Memory traces for figures in recall and recognition. *Arch. of Psychol.*, 1937, No. 216.
7. HEMPSTEAD, L. The perception of visual form. *Amer. J. Psychol.*, 1901, **12**, 185-192.
8. HUBBELL, M. Configurational properties considered "good" by naïve subjects. *Amer. J. Psychol.*, 1940, **53**, 46-69.
9. LINDEMANN, E. Experimentelle Untersuchungen über das Entstehen und Vergehen von Gestalten. *Psychol. Forsch.*, 1922, **2**, 412-423.
10. PERKINS, F. T. Symmetry in visual recall. *Amer. J. Psychol.*, 1932, **44**, 473-490.
11. TERMAN, L. M., & MERRILL, M. A. Measuring Intelligence. Boston: Houghton-Mifflin, 1937.
12. WERTHEIMER, M. Untersuchungen zur Lehre von der Gestalt. *Psychol. Forsch.*, 1923, **4**, 301-350.
13. WULF, F. Über die Veränderung von Vorstellungen (Gedächtnis und Gestalt). *Psychol., Forsch,* 1922, **3**, 333-389.

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THE PSYCHOLOGY OF FORMAL CREATIVENESS: I. SIX FUNDAMENTAL TYPES OF FORMAL EXPRESSION*

New York City

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A. GENERAL INTRODUCTION

Since I began scientific work in psychology three decades ago, one problem has attracted my attention again and again. This is the need for a clear statement of the laws governing the creative activities of man. Up till now not only their nature, but also their origin and their special characteristics, have been almost completely lost sight of in modern psychology.

The few studies devoted to the creative aspect of our mental lives confine themselves to observations of physical behavior as expressed in direct acts or, if they avoid this error, are based upon very complicated investigations of our associations and their relation to our conscious thought, emotions, feelings, and instincts. Such investigations, however, can lead only to an understanding of human behavior, but not to the understanding of those objective documentations which we, as human beings, consider the real results of our creative activity.

In our every-day realistic appraisal of human life we usually attach small value to the ordinary accompanying reactions, responses, and outlets. We fix our attention on the end results, "works and deeds of lasting value"; philosophies, scientific discoveries, poetry, art, political and social achievements. When we consider that the psychologist, on the contrary, as a rule chooses as material for his investigations, not these concrete results, but momentary responses, reactions, and outlets, it is not surprising that he has little information to give us about our real creative activities, but only about our specific and personal expressions and reactions.

Every creative tendency is—to use the term introduced into psychology by William McDougall—a propensity. It reaches fulfillment only when it results in some real creation and is not merely a manifestation of our social and physical behavior. If we are really interested in the study of human creativity we must consider the whole creative process, *including* the resultant creations; the fulfillment, the end object of the mental process of creation must at least be taken into account.

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In surveying those studies which have been made in this field we must be impressed by their invariable emphasis upon the purely intellectual reactions and expressions of man, such as thinking. There is a widespread conviction on the part of psychologists that scientific learning and scientific thinking are the highest and at the same time the most important form of human activity. But a student, whether from the individual or the social point of view, of education and anthropology, must find such an opinion at best one-sided and at worst erroneous and misleading. In examining the creative expression of the total of the human personality and investigating the processes involved in creative activity, there must be included and observed, in addition to the expressions and processes of thinking, two other forms of creativeness. These may be designated *gesture* and the *formal act*. Social psychologists have, to be sure, commented upon their existence, but rarely have they made them the objects of investigation. It is unfortunate that psychologists and especially social psychologists have not devoted more time and study to the problems of the human psyche as a whole, and to the evaluation of the different forces which contribute to its total activity. Many questions remain unsolved in regard to the quantitative and qualitative rôle played by this or that psychic expression or conscious activity as they relate to each other and to the totality of our psychic life, or as they influence our relations to other people. Harald Hoeffding and later the Leipzig school, especially Felix Krueger and Hans Driesch, made a beginning along these lines which did not, however, go much beyond a blueprint of the tasks. If the totality of our consciousness is considered from this viewpoint, the rôle of intelligence and reasoning appears much smaller than that assigned to it in certain present leading schools of psychology. The expressions of thinking have to share the prima donna rôle not only with expression of will and emotion, but with simple signals, gestures, and formal expressions. Especially in social psychology these last named forms of behavior prove to have equal as well as qualitative importance to that of intellectual and rational intercourse. A careful study of the wide field of application of formal acts makes it quite apparent that they comprise a much larger proportion of our social and creative expressions than that represented by the products of the intellect. They range from a smile and other forms of greeting to clothing and group activities, and from the most elementary artistic expressions like spontaneous song to all the different forms of fine and applied art.

The psychological importance of the formal expressions becomes still more impressive when we consider them from the genetic standpoint. We know that primitive man used formal expressions long before his intelligence had developed sufficiently to play the dominant rôle it has assumed in the life of modern man. However, the child of modern man still expresses himself in pre-intelligent formal language long before the intelligence functions have reached maturity. We speak of the play urge as the first social expression of the baby. We know further that the child uses formal symbolic language before he has command of coördinated rational statements.

We adults, too, not only make use of formal expressions as a more elementary primitive language than thought and words; we turn to drawing, to dance, to gestures and symbols, to express experiences which we are unable to put into words. In a recent paper I have discussed the combination of word and gesture in our expressions of humor.

There is another field in which the predominance of formal creativity and expression is of major importance, although the importance is of rather a tragic nature. There are wide spheres of human life in which intellectual activity and expression are impaired either because the individuals concerned are fundamentally incapable, or are too tired, or because of sickness or distress are handicapped physically or especially mentally. All ethnological primitivism belongs under this heading, also all expressions of mob or pleasure activity which "doesn't want to use the mind," and finally all that is done or produced by the mentally disabled. When, years ago (1) I first brought this problem to the attention of the psychological world in a study of the Swedish poet Strindberg, my formulations met with no understanding. August Strindberg suffered in certain periods of his life from severe manic-depressive intermissions of his enormous productivity as a writer, during which times he was unable to "use the word" but started to paint, producing a great number of remarkable paintings which are most interesting for the study of the borderline field of verbal and pure formal art. At this period he stepped down to a lower non-intellectual form-level of creativity.

Compared with the enormous mass of study devoted to the intellectual expressions of man and to their psychological bases, only a micro-fraction has been directed towards the problems of formal expression. We have of course a quantity of anthropological, ethnological, philological, and historical research, but the genetic and psychological background and creative dynamics have scarcely been touched. Work such as that of Carl Seashore upon musical creativity stands alone. Since psychologists are on the whole most eager to develop research in whatever direction their attention may be drawn, there must be a reason why formal activity has been so generally neglected. Various attempts and starts have indeed been made, but have stopped short, probably for lack of any immediate success. There have been, for instance, experiments in studying the consciousness of various highly-developed artists in different fields, by questionnaires regarding their subjective experience of creativity (6). These few studies never reached any appreciable results. Nor did the efforts towards any aesthetical psychology, such as those of Kuelpe, Lipps, and Krueger ever each any final conclusions as to the relations between the structure and dynamics of the individual consciousness and the products of formal expression. When the writer started his own psychological studies with the problems engaging the Leipzig School, there was a growing insight that the understanding of formal creativity could not proceed from the probing of individual consciousness. The starting-point should be an analysis of the origin and the psychological creative processes as shown in the birth of the most elementary art-forms. This was the period of the first research in paleontological and archaeological as well as child art, and of studies of aboriginal form creation and of folk and primitive art. Though this writer took part in practically all these lines of research, he found any considerable success only along the ethnological sector of the work, for which the *Internationale Voelkerpsychologische Institut* has been specially founded. The comparative experimental (2, 3, 4, 5) research with various groups of primitive and rural handicraft culture, in regard to their creative relationship to the most elementary form patterns, would have led to some definite results, had not the political and economic circumstances of 1933 put an end to this work. Fundamental form patterns and color schemes used by various groups were selected and abstracted, and were employed as testing methods for the creative efforts of large numbers of these people. Definite procedures were worked out to test and define their formal creative products. If it had been possible to generalize and systematize these results from the various groups into a general scheme, a theory of formal creative efforts would have been achieved, at least in regard to a few elementary formal expressions, as for instance the circle, the square, the oval, the cross, and the rhomb or facet.

When, in the middle of the twenties, the writer came to this country to lecture upon the first results of this research, his work met with great interest and even support; however upon his return 10 years later, after far more advanced research, interest in this type of study had completely died out. Only an unusual scientific accident led to the development of a new method and a new standpoint in regard to the entire problem, which not only opened a road along which it was possible to advance rapidly to basically important results, but which proved acceptable or at least discussable in terms of the patterns of scientific research at present most generally acknowledged in this country.

The following pages offer the first fundamental results of this new project, whose aim is to formulate a "psychology of formal creativeness." The various results have been studied in the form of different research projects, separately set up and independently executed, so that they may legitimately be published as individual papers which together will present the basic principles of a "psychology of formal creativeness." The *Six Types of Formal Creativeness* is published here as the first section, not only because this study is the first result, first started and first finished, but also because it seems to provide the basic approach to the entire problem.

B. SIX FUNDAMENTAL TYPES OF FORMAL EXPRESSION

1. *History of the Research*

During 1937 a research project was set going which aimed (7, 8, 9) at a method of testing abnormal trends in children by aid of drawing activity. Since it was necessary to concentrate the child's attention upon his drawing we had to devise a means to win him away from thinking and phantasy activities and force him to apply himself sincerely to formal expression. My most able collaborator, the art-teacher Rose C. Pine, suggested a procedure known in art teaching circles as line-analysis. This term, which does not fit too well what is meant by it, designates the attempt to express by a simple line the meaning of a word describing some everyday activity, such as eating, walking, dancing, sleeping, etc. By forcing the child—or the adult—to concentrate upon such a formal abstraction from simple facts of experience, there is achieved not only an ability for formal abstraction and expression as such, but the beginning of an ability to express, in a formal way, a wider range of experience. This was what was needed for our attempts to obtain forms of expression for the abnormal and often half-conscious experiences of the sub- or abnormal juvenile mind, and which provided the background for this study and for several other investigations having the same end in view.

When the first few hundred of these line-analyses were examined, the writer was struck by the elementary character of the form which stood out in these simple tests, and by a certain repetition of identical form patterns which will have to be discussed later. The possibility of continuing, on a new level, the earlier research for an acceptable basis for a psychology of formal creativity again appeared on the horizon, and, after several months of experimenting proved substantial. In the slow development of this research based on the principal formal creative elements, it soon became evident that the new way was not only better and easier than any previous attempts, but that it also avoided the most disadvantageous of the mistakes which had interfered with their progress (9). The research was no longer confined to limited and exceptional groups, or to special aspects, as for instance to the subjective reactions of creative artists with their tendency towards intellectual fantasy based on inadequately controlled material, or to the products of difficult groups like children or primitives. The new procedure proved uniformly applicable to all groups belonging to any sphere of modern civilization. Instead of dogmatizing upon what were believed the most mathematically or aesthetically simple forms, we worked with the forms which were themselves the products of an effort towards consciousness. The result was that identical responses were drawn from a mass of individuals chosen from every walk of life. And finally the relationship to the rational and intellectual pattern of modern civilization was provided by giving it a definite part in the research—by using it in the negative way of abstracting certain simple contents of experience to assist in the determination of the laws governing formal creativity. After several years experience the following method was developed.

2. *Description of the Investigation Method*

After it was realized that line-analysis would yield a fundamental law of formal creativeness the following list of words with a supplementary series was compiled, as the best means for the task we had in mind (Table 1).

TABLE 1

I	II
Walking	Happy
Dancing	Silence
Silent	Depressed
Happiness	Straight
Depressed	Walking
Fighting	Fighting
Thought	Singing
Laugh	Cry
Drinking	Fear
Bark	Laughing
Lie	Lie
Lovely	Love

These words and their serial arrangement were selected not only for purposes of research but according to certain pedagogics of execution. To begin with, the concepts of walking and dancing provide for almost every one an easy approach to the task, since "walking" is perhaps the easiest word to abstract into a simple line, and "dancing" is an immediate and vital aesthetical development of the same act. The next word "silence" is chosen as a release of the tendency to abstraction which has been set going by the first two words. The two following words "happiness" and "depressed," by representing contradictory emotions, lead still further away from realistic representation into abstract expression. This contradiction will be shown later on to constitute an important factor in our test. "Fighting" and "thought" are chosen because of a differing contrast between affective outlet and stable thinking, while "laugh" and "drinking" swing again to the reverse side of psychic activity. The last three words represent more rare expressions and were actually selected for that reason. Especially interesting results were derived from the double meaning of "lie."

The second series was selected to form an extension of the first. To assure objectivity in our results, a second test was needed, usually given two or three weeks later, with the hope that the first test would be forgotten. We then gave the second series which differed fundamentally from the first, but some words of the first series were interspersed as a check-up for the answers given in the earlier test. As a final proof, the first test was usually repeated three or four weeks after the second test.

These two tests were given to adults and to children down to the age of eight. For younger children we used shorter series with simpler words, whose meaning we could be sure was understood by the child. This same simplification was used in the testing of the several dozen mentally abnormal adults and children, to whom we gave the test in order to ascertain that results would be identical in any human mind able to undergo the procedure at all.

3. *Methods of Application and Evaluation of the Results*

Our line-analysis test was given to about 10,000 persons, mostly in groups but also frequently to individuals. We tested practically all ages, adult men and women as well as college students and school children down to kindergarten age; professional groups, such as artists, musicians and students of art schools; and also, as was mentioned above, inmates of mental institutions.

The subjects were never informed of the real purpose of the test. Adults were led to believe that this was a game, and students told that the test would demonstrate their artistic abilities. Small children were also given the test as a game. The method of the test was explained in a simple way, by showing a simple graph of one word, usually executed on the spot by the tester. This word would be one not included in the test, but easy to picture, like for instance the word "jump." In order to make small children more conscious of the words they were to picture, they were asked to copy the list on a sheet with ample space for drawing. Older students and adults were given mimeographed forms to execute. Ample time was allowed, and no pressure used to achieve this or that result.

Even during the first observations leading to the development of the test a purely phenomenological inductive comparative method of evaluation was applied. When the first several hundred line-analyses by abnormal children was handed in, I noted the appearance of identical responses on a large number of sheets. No more theoretical concepts were allowed to influence the execution of the later and the final forms of the test than had been the case with these first observations. The tests were simply compared, and identical results placed together and registered on a statistical basis.

In an inductive comparison special types of formal expression were found to appear again and again, and by grouping them together we were able to classify them into six different categories. Each and every response could be fitted into one of these categories. What was more important, an appreciable percentage (nearly 10 per cent) of the total responses by one individual, which included the entire test and the customary repetitions, were given entirely in one of the six types of formal expression. The actually pure form of these six types of response seems to justify their application as six categories of formal creativity, which can serve as the basis for the theory set forth in this study and which will be developed further in additional studies.

As has been shown, these formal categories are not preconceived "most simple forms," nor have they any relation to fundamental mathematical or exact geometrical categories; they are simple formal responses in abstract form to intellectually formulated contents of familiar human experience. *Our formal categories are actual psychological, or better, social-psychological responses representing what might be termed the "formal propensity."* Furthermore, at this point we are not using these categories in the narrower sense of the experience and the expression of beauty. *Our catgories are pre-aesthetic, and form merely the basis for beautiful formal expression.* This very fundamental relationship will be dealt with intensively in a second study of this series, which will be devoted to the relation between our basic formal categories and the primary aesthetic categories. A great deal of misinterpretation in the fields of ethnology, anthropology, and even social anthropology and cultural psychology, and a failure in human understanding, has resulted from the use of purely aesthetic formal concepts in the study of formal human behavior in ritual and custom. We hope here to open a road for a study of formal expression free of such misconceptions.

Proponents of *Gestalt* psychology or other schools, who have to some degree developed a psychological theory of form, may ask us here how our test stands in regard to the contradiction of form and content, or the static versus the dynamic concepts of formal expression. We have to answer that these distinctions lie outside its own psychological categories. In a future study we will discuss its relation to the fundamental categories of other concepts, but not until our own theory has been at least broadly outlined. To begin with a disquisition of these other concepts would be to put the cart before the horse. If, however, our tests are examined from these differential angles, it will be found that considerations of form and content, and of static and dynamic character, are included in our conception.

4. *The Six Fundamental Types of Formal Expression*[1]

It will be obvious to every one that these six fundamental types of expression can be more clearly presented in their purest form than in their mixed and less developed manifestations. We are therefore showing here only pictures exemplifying pure types, products of individuals who executed all tests according to one type pattern. We have mentioned that such a uniform presentation was found only in a small number of cases. The manner of representation will be discussed later. In our reproductions, to demonstrate our typology as clearly as possible, we place together always two pictures of the same type, usually by a child and an adult.

Type I. Some individuals feel that the proper method to perform this test is to draw a single small sign, similar to a letter of the alphabet. Only one sign is used for each word and each sign is different. We have termed this the MONOGRAPHICAL TYPE.

Type II. A second group likewise uses a small sign, but this sign is repeated in a formal way after the word is described. In general appearance this type form resembles the forms basic to most decorative art. We have called this the CURSIVE TYPE.

Type III. We find a good many individuals who lack the ability to ex-

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[1] This creative form typology was first presented at a meeting of the American Psychological Association at Berkeley, California, and published in the "Program Number" of the *Psychological Bulletin,* **36**, p. 526. At that time the work on the test was as yet incomplete; and later on it was decided to change the number of the different types because of the possibility of misunderstanding. The second and third of these studies should entirely obviate this difficulty.

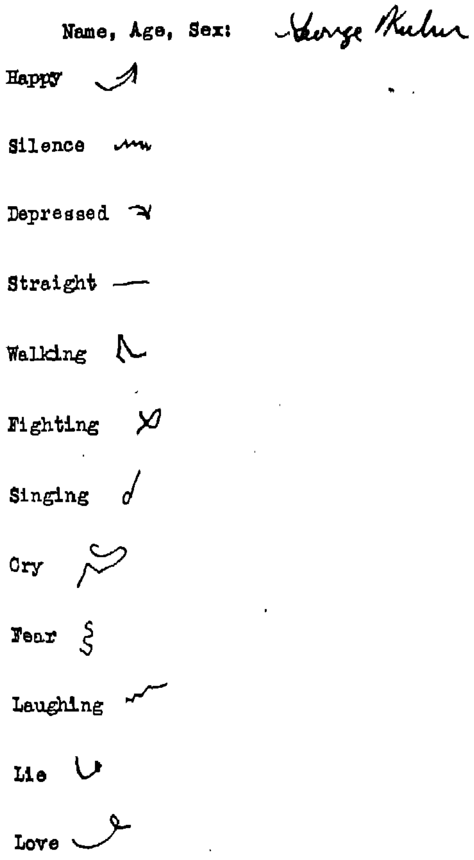


FIGURE 1
TYPE I
(The Monographical Type: Student, Age 21)

press abstractions in a single line. They can abstract a word only in some kind of symbolic or pictorial way. They draw a shoe or steps for walking, a glass for drinking, a smiling mouth for laughing. Each reproduction of the contents of a word expresses some meaning pictorially related to this content. We call this type the PICTOGRAPHICAL TYPE.

Type IV. Another group of our subjects produced as their response a single long line like those we see in a graph. The specific character of these graphs was the rhythmic repetition of one or two, or sometimes even three, form motives which were tied together in the one line. Since this expression

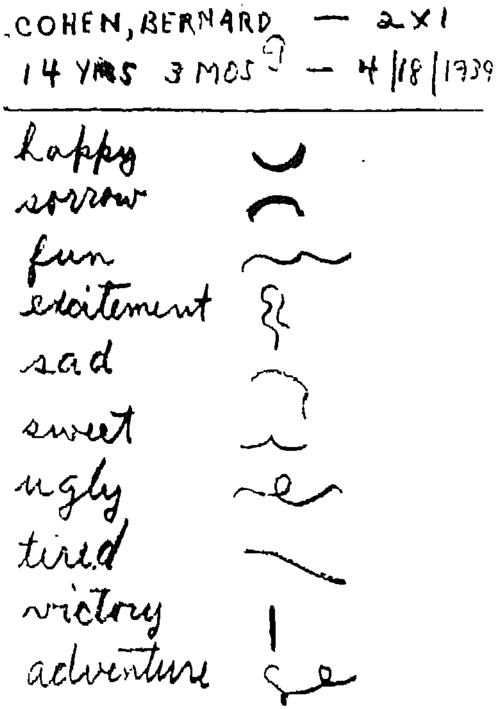
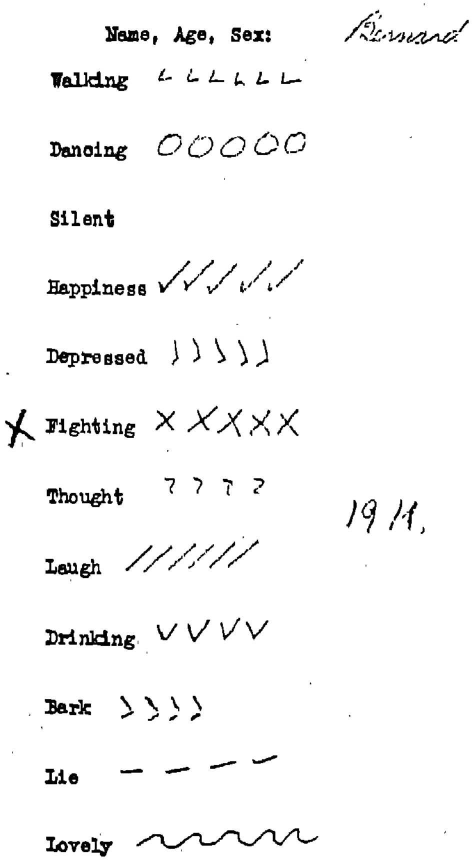


FIGURE 1A
TYPE I
(The Monographical Type: Child, Age 14)

somewhat resembles our writing technique, we have called this type the SCRIPT TYPE.

Type V. This type is probably from the psychological point of view the most interesting, since it gives the purest demonstration of psychological character. It expresses most concretely the direct emotional response to the test. In form this type of response stands between the pictographic and the script types. There is, however, a definite symbolic element involved which expresses an emotional element only. Its similarity to the script type lies in the actual form pattern which is similar to that described above. But the emotional factor is the basic element in this type. Each word of the test is considered according to its emotional implications. But the world of emotion has a dualistic character of positive and negative, which by many is expressed in a spatial way as high or low—low for the negative and high for the positive emotional experiences. For these people emotional experi-



Name, Age, Sex: Bernard

Walking

Dancing

Silent

Happiness

Depressed

Fighting

Thought

19 M,

Laugh

Drinking

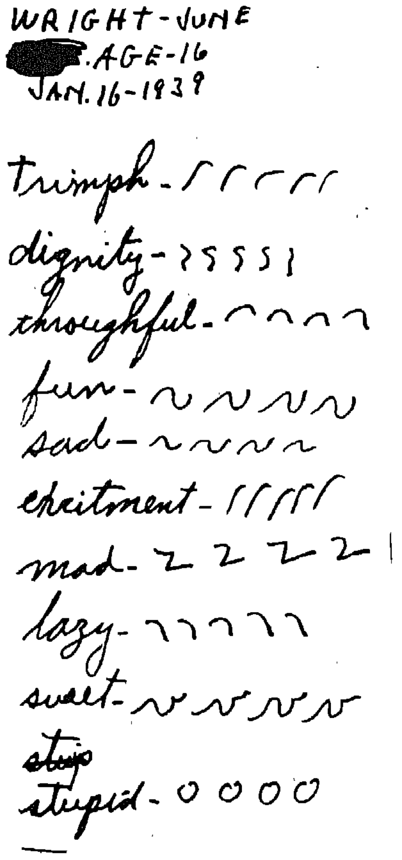
Bark

Lie

Lovely

FIGURE 2
TYPE II
(The Cursive Type: Student, Age 19)

ence has always either an ascending or a descending character. In colloquial speech every one uses this type of expression. We feel in "high" spirits, or we "feel low." An emotional trend is expressed in nearly every line of these abstracts; nearly every line goes up or down, according to the emotional connotation of this or that word. This type depicts not only emotions as such—happiness, depression—but also the effect of the content of the word upon the whole emotional experience. Laughing is related to "high" spirits, and drinking to a marked emotional ambivalence. In this way each content of the line-analysis is related to the "ups" and "downs" of our



WRIGHT-JUNE
[redacted].AGE-16
JAN. 16-1939

trimph-
dignity-
throughful-
fun-
sad-
ehcitment-
mad-
lazy-
sweet-
~~stup~~
stupid-

FIGURE 2A
TYPE II
(The Cursive Type: High-school Girl, Age 16)

existence and at the same time related to the space on the paper. Since our types concern the formal aspects of the test results, this category has been named the SPATIAL TYPE.

Type VI. The last group, arrived at by process of elimination, was found to lack any definite formal fixation. In this case the response is simply one line going without any pattern in this or that direction. Since there is no formal expression beyond the fulfillment of the task by bringing the line to an end, we have called this the FINAL TYPE.

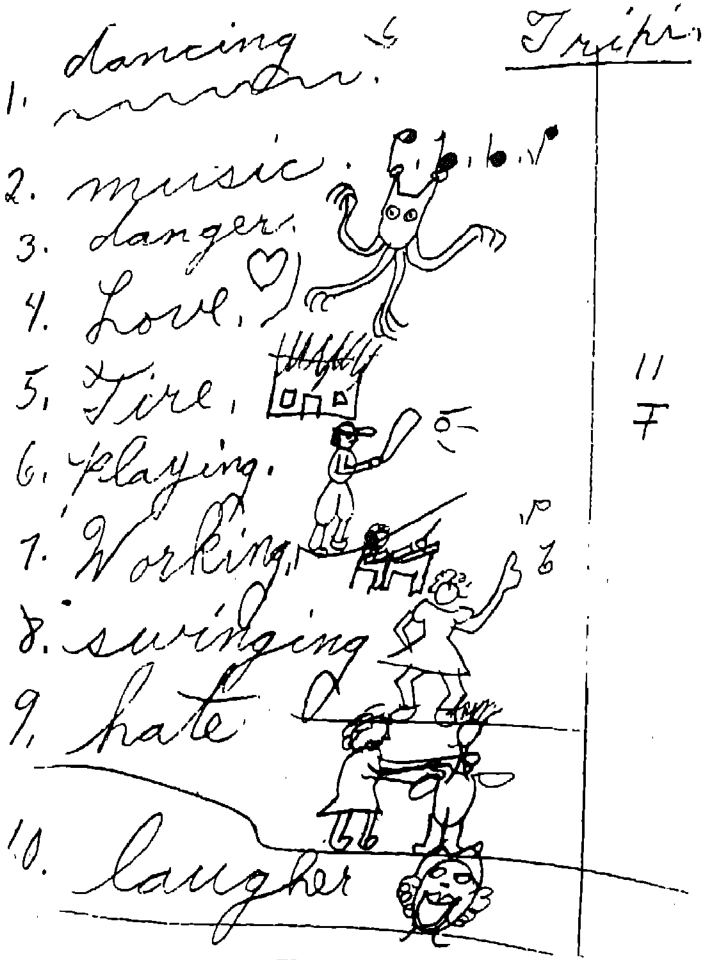


FIGURE 3
Type III
(Pictographical Type: Child, Age 11)

5. *Classification of the Individual Responses*

We repeat: All formal expressions resulting from this test can be classified in one or other of the six categories enumerated above. However, only 9 out of every 100 responses represent a pure example; that is, the product of an individual who responds always in the formal language of one type. The rest are mixtures of various types. These mixtures are found in two

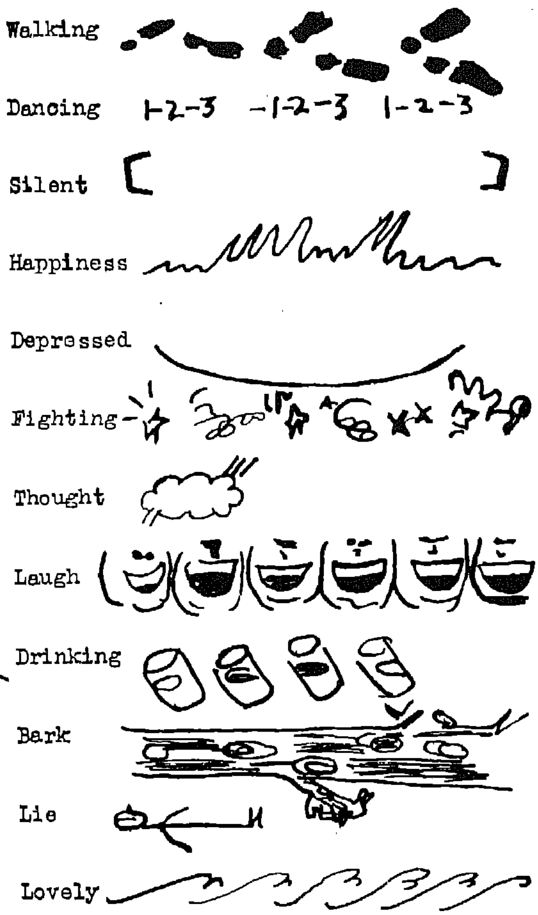


FIGURE 3A
Type III
(Pictographical Type)

forms. One, which may be called loosely-blended, consists of such cases where each separate answer is made in one type only. The other form may be called amalgamated, since one answer often combines two or even three types of expression. The first form is the more frequent; the second comparatively rare. To determine the type to which an individual belongs we have used simply the 55 per cent quantitive criterion. In cases where two types of response appeared with at least 55 per cent frequency we have used the designation: Type no. Mixed, *plus*.

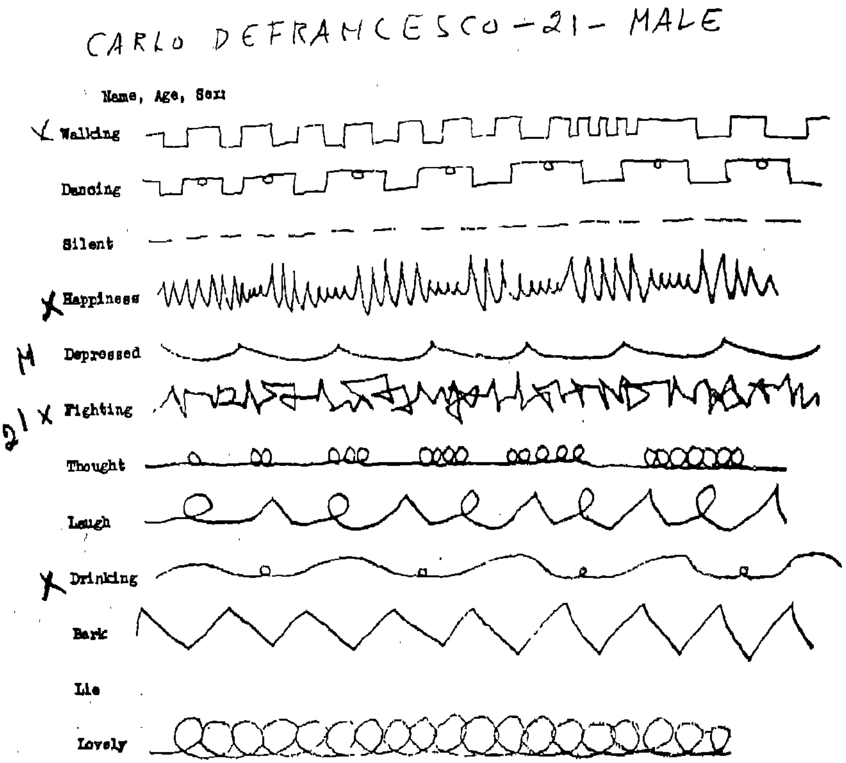


FIGURE 4
TYPE IV
(The Script Type: Student, Age 21)

6. *Specific Characteristics*

A by-product of this study will contribute much of value to further investigations. It was found that definite artistic abilities do not coincide with representation according to a pure type form. Artists as a rule give rather mixed responses. Furthermore, there cannot, on the basis of this test, be found any definite correlation between a type of response and an aptitude for a specific expression of art. We have tested musicians and gifted writers without being able to establish such a relationship. They invariably demonstrate an even higher percentage of mixed types of response than is given by the average aesthetically untrained individual. In a later study, however, it will be shown that there exist specific form identifications which in a

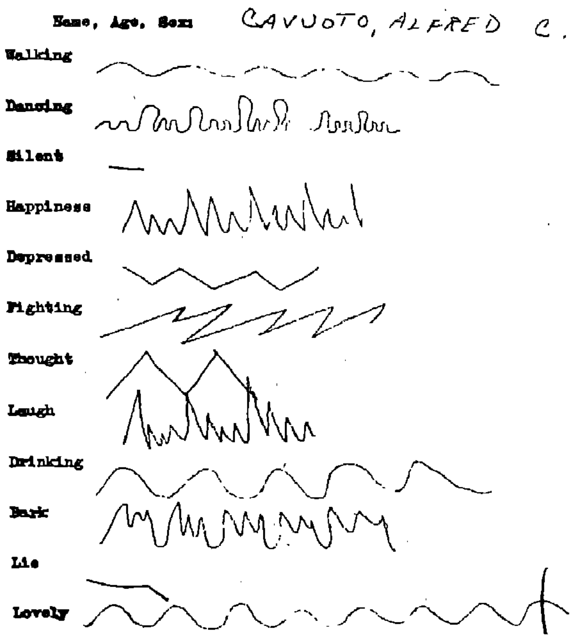


FIGURE 4A
TYPE IV
(The Script Type: Music Student, Age 20)

more refined formal test can be used for the investigation of the most specific art expressions.

Neither are there any specific differences attributable to other social distinctions. The types are as clearly expressed by children of kindergarten age as by any adult group; and primitive people, once they grasp the meaning of the test, respond to it as well as cultivated or even professionally trained individuals. Nor is there any difference between the sexes.

One individual characteristic is found in the general pattern of response. It is easy to observe in any test the general richness or poverty of formal expression. We see test sheets in which the lines hardly distinguish themselves from each other. The poorest response, curiously enough, was given me by a rather distinguished psychologist, who did nothing beyond drawing thin ⅓ inch lines in various directions. Nevertheless, he documented him-

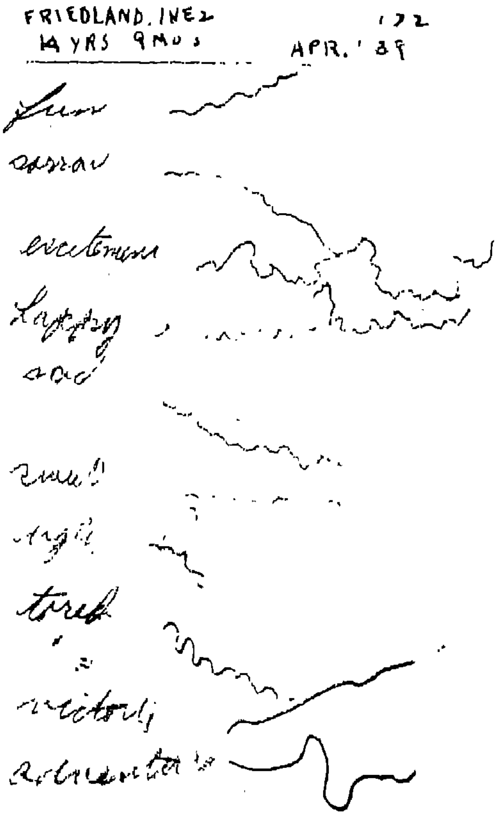


FIGURE 5
TYPE V
(The Spatial Type: Child, Age 14)

self as belonging to the monographic type. And this is a factor of great importance: that even the poorest possible formal expression can be classified as belonging to one of the six categories of formal creativeness. Richness of execution may appear either in a plurality of formal expressions within the language of one type or also, of course, in a mixture of various types. The finest answers of the last type are frequently produced by decorative artists. The most beautiful answer I ever received was from a deaf-mute student from a textile school. However, it cannot be said that being a creative artist assures a rich response. I have had the opportunity to test some highly-esteemed artists who showed rather second-rate responses.

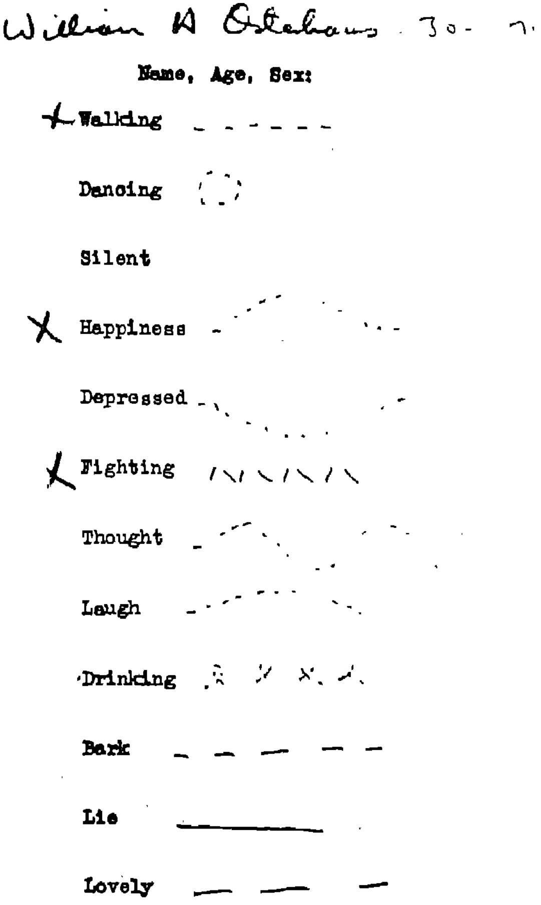


FIGURE 5A
TYPE V
(The Spatial Type: Adult, Age 30)

7. *Relationships between the Types* (The Amalgamation of Types)

We have differentiated the mixed types by dividing them into the loosely-blended and the amalgamated. The first group uses type forms one after the other; the second combines several in one response. One could also call the first kind of response unrelated, and the second related. The related forms deserve a short discussion here since they actually constitute specific variations of the types. The most frequent type to create an amalgamated

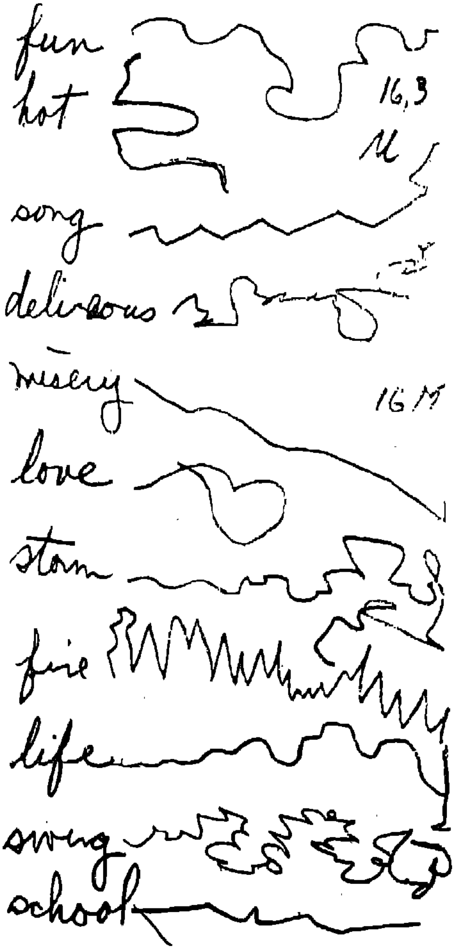


FIGURE 6
TYPE VI
(The Final Type: High-school Boy, Age 16)

form of response is the pictographical. Individuals of this type are unable to abstract completely and always react to some extent imaginatively when asked to express an intellectual or emotional concept in a symbolic pictorial way. However, many of this type have at the same time a tendency to another pure type form, frequently the monographic, so that they produce their symbols in a small formal unit. They sometimes also combine with

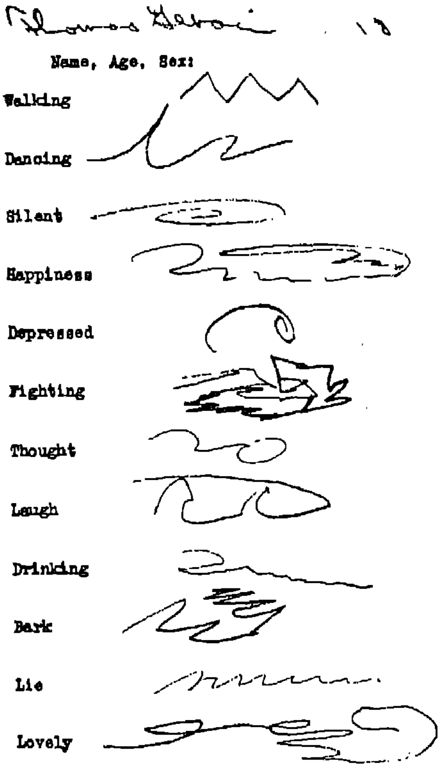


FIGURE 6A
TYPE VI
(The Final Type: Student, Age 18)

the spatial and cursive types. In just this combination we find a third element which is easy to explain. Because of their difficulty in abstracting they tend to an anthropomorphism which explains everything as human action. We find therefore many of their responses in the shape of small human figures or heads, or other parts of the body, or as interaction between figures. One of the most amusing responses of this kind depicted every concept by an expression of the eye. There was, of course, here a strong tendency of the monographic type. Since this type of response is not only rather frequent but also clearly defined, I believe it is justifiable to separate it from the others by giving it the name of ANTHROPOMORPHIC TYPE. This variant contains of course nothing not contained in the six fundamental types.

There is considerable difference in regard to the affinity the six basic types have for each other in the formation of amalgamated types. On the whole it can be said that practically every type has at least one other with which it can combine. The final type appears to combine least readily with others; however, in a few cases we have found it amalgamated with the spatial type. This spatial type is the one which, aside from the pictographical, seems to tend most frequently towards amalgamation.

8. *Neurotic Forms*

It was stated above that the discovery of the six formal types was made during research work on a test for mentally abnormal individuals. Not only during this initial experiment but through the following systematic studies we were able to ascertain that this formal test would document specific results of varying nature in the case of the more severe mental disturbances. Although this problem must await further discussion, a short paragraph concerning these very specific kinds of formal response should be included at this point. In general it can be said that mentally abnormal individuals tend to lean markedly to one type or another, and that their special abnormality seems to play a fundamental rôle in their choice of type form. However, there is as yet no definitive result which would enable us to identify a specific response pattern with specifically denominated forms of mental disease; for instance, with a schizophrenic or depressive illness. But such identifications do not lie outside the bounds of possibility, in fact, we are quite certain that they will form the subject of a later paper. Here we want merely to stress the fact that any mental abnormality tends to reflect itself in this kind of form test. I like to illustrate this with the response of a neurotic eight-year-old girl. Her abnormality is evidenced by her mistakes in elementary spelling—a generally accepted symptom of juvenile neuroticism or backwardness. In her response one had to observe the uncertainty and confusion of her formal expression and her inability to achieve the one simple form—that of the quartering line—which seems to be the goal of all her attempts. This confusion and indecision characterize practically all responses of neurotics, and where we find them in a test, we can be sure we are dealing with a mentally ill person.

Another symptom of mental illness, in addition to those indicated just above, is a certain rigidity. We had very few drawings showing this trait, since we had very limited opportunities to test cases which would respond in this way. Eugen Bleuler, in his famous *Textbook of Psychiatry*, published some examples of handwriting clearly representing this type of insanity. Our results up to now are identical with his findings. A later paper will present a test suitable for the investigation of mental pathology.

9. *Some Statistics*

Although this writer does not believe overmuch in dogmatic and detailed statistics, certain statistical findings of our study have proved enlightening. However, we have not worked through all our material statistically. What we have done up to now is to take at random 3,000 responses, and examine statistically the distribution of the six types.

It has been mentioned that of these 9 to 10 per cent proved to be pure type responses. This means that about every tenth individual tends definitely towards one type of formal expression. A comparison of the frequency of distribution of the six types is most interesting. We found the following percentage of responses: I: 14; II: 11; III: 28; IV: 16; V: 24; VI: 7. This means that the highest percentage, over a quarter of the responses, falls to the pictographic type, the type unable to abstract more or less perfectly the contents of words. Nearly another quarter belongs to the emotional type with spatial responses. The fewest answers come from the final type, which is actually the formally least decisive. We further tried to ascertain the proportion of types in the pure responses. Here are the results: I: 16; II: 12; III: 29; IV: 12; V: 21; VI: 10. These pure responses give the greatest increase to Type VI, the final type, and in the second place to the monographic type. The greatest decrease is in the script type and, in the second place, in the spatial type. It is not yet possible from this first study to give a definite explanation in regard to the occurrence of the types—this task will be possible only after several other series of experiments. It may be remarked, however, that, as seems natural, the type expressing greatest formal insecurity appears most frequently in the series of pure expressions than in the mixed examples. It is equally to be expected that the most simple form of response, the monographic type, is more frequent in the pure answer series. There is, as far as I can see, no definite explanation why the emotional type appears less frequently in the pure answer series. However, the most refined type, the script, could hardly help decreasing in that series.

C. SUMMARY

By aid of a simple line-analysis procedure we have found the possibility, for every individual, of the testing of his innate most elementary form expression, which cannot be identified with any aesthetic or mathematical system but appears to be the aboriginal psychological response of our formal propensity. In a comparative study of the responses, we find that all responses can be divided into six fundamental types, which appear in somewhat less than 10 per cent in pure form; the rest appear in mixed form. The discovery of these types occurred during a research project devoted to abnormal psychology and the first and most evident application and importance of this test seems to lie in the field of mental illness, since individuals mentally afflicted produce definite patterns which, although belonging to these formal types, nevertheless differ fundamentally from the expressions of normal people. There are without doubt many other possible applications of these form types, which will be discussed in continuations of this series of studies.

References

1. Harms, E. August Strindberg als Maler. *Kunst und Kuenstler* (Berlin), 1927, **25**, 342-346.
2. ———. An institute for experimental folkpsychology. *Folklore* (London), 1930, **16**, 291-298.
3. ———. Ueber eine neue Art und Verwendung von Tests. *Schweiz. Psychol. Rdsch.*, 1930, Aug.-Sept., I-II.
4. ———. The importance of folkpsychology for young people. (Lettish.) *Rakstu Karjums* (Yearbook of the Lettish National Academy), Riga, 1930, **20**, 24-48.
5. ———. The Fin-Baltic problems in the light of folkpsychology. (Danish), *Forum* (Copenhaguen), 1931, May, 269-275.
6. ———. Das Normale Genie. *Centralb. f. Psychother.* (Berlin), 1932.
7. ———. Art and the good life. *J. Adult. Educ.*, 1939, **2**, 1-4.
8. ———. Kinderkunst als Diagnostisches Hilfsmittel. *Ztsch. Kinder-Psychiat.*, 1940, **4**, 129-143.
9. ———. Child art as an aid in diagnosis of juvenile neuroses. *Amer. J. Orthopsychiat.*, 1941, **2**, 191-209.
10. ———. Prolegomena on monistic aesthetics. *J. Aesthet.*, 1941, **1**, 96-104.
11. ———. The development of humor. *J. Abn. & Soc. Psychol.*, 1943, **38**, 351-369.
12. ———. The arts as applied psychotherapy. *Occupt. Ther. & Rehab.*, 1944, **23**, 51-61.
13. ———. The development of religious experience in children. *Amer. J. Sociol.*, 1944, **50**, 112-122.

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The Journal of Genetic Psychology, 1946, 69, 121-129.

BOOKS

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(1943)

GESELL, A., & ILG, F. L. Infant and Child in the Culture of Today. New York: Harper, 1943. Pp. 399.

LEEPER, R. W. Lewin's Topological and Vector Psychology. Eugene: Univ. Oregon, 1943. Pp. 218.

YERKES, R. M. Chimpanzees: A Laboratory Colony. New Haven: Yale Univ. Press, 1943. Pp. 321.

YOUNG, P. T. Emotion in Man and Animal. New York: Wiley, 1943. Pp. 422.

MASSERMAN, J. H. Behavior and Neurosis. Chicago: Univ. Chicago Press, 1943. Pp. 269.

MAY, M. A. A Social Psychology of War and Peace. New Haven: Yale Univ. Press, 1943. Pp. 281.

WOLFF, W. The Expression of Personality. New York: Harper, 1943. Pp. 334.

ESTABROOKS, G. H. Hypnotism. New York: Dutton, 1943. Pp. 249.

BARKER, R. G., KOUNIN, J. S., & WRIGHT, H. F. Child Behavior and Development. New York: McGraw-Hill, 1943. Pp. 652.

NEWCOMB, T. M. Personality and Social Change. New York: Dryden, 1943. Pp. 225.

McGRAW, M. B. The Neuromuscular Maturation of the Human Infant. New York: Columbia Univ. Press, 1943. Pp. 140.

CHILD, I. L. Italian or American? The Second Generation in Conflict. New Haven: Yale Univ. Press, 1943. Pp. 208.

GRIFFITH, C. R. Principles of Systematic Psychology. Urbana, Ill.: Univ. Illinois Press, 1943. Pp. 718.

MEIER, N. C. Military Psychology. New York: Harper, 1943. Pp. 395.

STRONG, E. K., JR. Vocational Interests of Men and Women. Stanford University: Stanford Univ. Press, 1943. Pp. 746.

TOMKINS, S. S. (*Ed.*) Contemporary Psychopathology. Cambridge: Harvard Univ. Press, 1943. Pp. 600.

HULL, C. L. Principles of Behavior. New York: Appleton-Century, 1943. Pp. 422.

(1944)

CANTRIL, H. Gauging Public Opinion. Princeton: Princeton Univ. Press, 1944. Pp. 318.

HUNT, J. M. (*Ed.*) Personality and the Behavior Disorders. (2 vols.) New York: Ronald Press, 1944. Pp. 1242.

(1945)

MURPHY, G., *Ed.* Human Nature and Enduring Peace. New York: Houghton Mifflin, 1945. Pp. 475.

FREUD, A., *et al.* (*Editors*). The Psychoanalytic Study of the Child. (An annual, Vol. 1.) New York: International, 1945. Pp. 423.

FLÜGEL, J. C. Man, Morals, and Society. New York: International, 1945. Pp. 328.

RAPAPORT, D. Diagnostic Psychological Testing. (2 vols.) Chicago: Yearbook, 1945. Pp. 573 & 516.

WERTHEIMER, M. Productive Thinking. New York: Harper, 1945. Pp. 224.

LEWIS, N. D. C., & PACELLA, B. L. Modern Trends in Child Psychiatry. New York: International, 1945. Pp. 341.

(1946)

HARRIMAN, P. L., *Ed.* Twentieth Century Psychology. New York: Philosophical Library, 1946. Pp. 712.

MASSERMAN, J. H. Principles of Dynamic Psychiatry. Philadelphia: Saunders, 1946. Pp. 322.

SEWARD, G. H. Sex and the Social Order. New York: McGraw-Hill, 1946. Pp. 301.

SMITH, B. L., LASSWELL, H. D., & CASEY, R. D. Propaganda, Communication, and Public Opinion. Princeton: Princeton Univ. Press, 1946. Pp. 435.

MORENO, J. L. Psychodrama. New York: Beacon House, 1946. Pp. 429.

SYMONDS, P. M. The Dynamics of Human Adjustment. New York: Appleton, Century, 1946. Pp. 666.

CRITICAL REVIEWS OF RECENT BOOKS

The Journal of Genetic Psychology, 1946, **69**, 123-128.

(Rapaport, D. Diagnostic Psychological Testing: Vol. 1. Chicago: Yearbook Publishers, 1945. Pp. 573).

REVIEWED BY CLARE WRIGHT THOMPSON

This work is "an attempt to explore systematically the diagnostic potentialities of seven psychological tests, used simultaneously" (p. v). There is little question but that any publication which fulfilled this purpose would win acclaim from both those psychologists engaged in clinical practice and those concerned with the theory of mental development and personality; for a comprehensive work on the experimental foundations of clinical techniques is long overdue. In spite of its more than 113 tables and 38 figures, however, *Diagnostic Psychological Testing* is not experimentally oriented: its purpose is to tell and not to find. Thus:

> The study grew out of clinical experience: it was not as so many studies on tests are, the effort of academically-trained psychologists to "clean up," by systematic but mechanical statistical approach, the confusion of "hunches," "insights," and "intuitions" rampant in testing work. The significance of the diagnostic indicators of these tests has crystallized, for the present authors, in the course of evaluating test findings within the frame of reference of past findings and of modifying that frame of reference so as to include new findings. The study itself was designed to put into communicable form what had thus far crystallized (p. 12).

The author pleads throughout for a non-mechanical use of intelligence tests. With this one must heartily agree. The intelligence test yields not only an *IQ*, but a behavior sample as well, in which the experienced examiner can weigh the subject's response against the responses of hundreds of other subjects to whom, in the past, he has put exactly the same item. Thus Rapaport points out that "the response, 'Wheeled vehicles for transportation on land,' to the question 'In what way are a wagon and a bicycle the same?,' obtains full credit; but its deviation from the usual responses, its over-exactness and relative redundancy, should raise the question in the examiner's mind, 'Is this person really as doubt-laden and over-meticulous as this response indicates?' " (p. 41). From such a use of intelligence test items it is, however, a far jump to "pattern analysis"—to either the demonstration of statistically significant differences between clinical groups or the diagnosis of clinical entities upon relationships between psychometric scores. What careful studies have been made of such patterning in clinical groups have resulted largely in showing that the rules of thumb commonly used by practicing clinicians cannot be demonstrated in clinical groups controlled for diagnostic category and for age.

The results on seven tests are reported in two volumes, of which the first, dealing with the Wechsler-Bellevue, the Babcock Test, the Goldstein Scheerer Sorting Test, and the Hanfmann-Kasanin (Vigotsky) Test, is considered here. The groups on which findings are reported consist of all clinical cases (except a few excluded for valid reasons) examined at the Menninger Clinic during a three-and-one-half-year period. Results on these cases are contrasted with a "control" group of 54 Kansas State Highway Patrolmen. One wishes, especially in the case of the Wechsler-Bellevue, that the large if urban standardization population for the scale might have been used as a control. Certainly the Kansas patrolmen differ from the clinical group in having no female members, and in having a mean age of 35 years whereas the mean ages of the various clinical groups range from 20 to 61 years, neither of which considerations enters into the discussion of findings; and in showing "a limited range of interests, a tendency toward some degree of withdrawal, an unusual lack of colorfulness" (p. 29), and especially in having a lower educational and cultural background than the patients of a private mental hospital, both of which differences are mentioned by the author.

The clinical diagnoses are those found useful by Rapaport and the clinic with which he is associated and therefore to say that they are not the usual textbook classifications is not a valid criticism. For example, there is a group of Over-Ideational Preschizophrenics who on casual examination resemble Obsessional Neurotics. The differential diagnosis between these two groups is felt to be of utmost importance because treatment techniques suitable to the Obsessional Neurotic when attempted with the over-ideational Preschizophrenic "only facilitate the breakthrough of the schizophrenic process, rather than fortify the patient to withstand it" (p. 22). With clinical groups classified on the basis of such considerations, one cannot quarrel. On the other hand, it should be pointed out that, for example, the total schizophrenic group includes only 64 members ranging from 15 to 55 years. When this group is broken down, as it is, into six subgroups, none of these has more than 17 members in all, or more than seven in a single decade of life age. Statistically to demonstrate valid differences among such groups is an impossible task. In this connection, and indeed when considering any portion of the book, it should be kept in mind that never is it claimed that the clinical diagnosis of the groups used were independent of the psychometric procedures. Indeed what references are made to clinic procedure, for as example on page 14, would indicate that such independence did not exist.

Suggestions are made for changes in the administration of the tests considered so that the results may be clinically more meaningful. Again, this is a matter of opinion with which one can hardly take issue. It should be recognized, however, that in so using the tests one renders the results unsuitable for comparison with the standardization group of the test under consideration or with the results of other workers. For example, Rapaport recommends that Sentence Repetition be omitted from the Babcock Repetition Group. The rationale for this is that it "tends to remain relatively unimpaired, at least much less impaired than Digit Span" (p. 322), and that the three subtests of the group "measure different functions" (p. 323). In as much as the principle behind most scale construction is minimum correlation between subtests it is difficult to see just why the reason advanced makes it desirable to omit this subtest. Also he objects to Babcock's instructions for administering the maze test because these contain no caution as to speed. To remedy this situation, the subject is given another trial "with the added instruction to be less cautious and to do it really as fast as he can" (p. 333). This procedure enables the examiner to distinguish between overcautiousness and motor retardation. Valuable as is any aid to such differential diagnosis, the value of the book would be infinitely increased if the findings were presented against the background of previous work in the field not, as they are, *ab ovo.*

This same neglect of the work of other investigators detracts from the theoretical chapters on concept formation and the "psychological rationale" given for each subtest. These latter are arm-chair discussions of the "function" underlying each subtest: e.g., on the Wechsler-Bellevue, the Comprehension test measures "judgment," the Similarities test "verbal concept formation," the Picture Arrangement test "planning and anticipation," etc. These sections are reminiscent of the writings of an earlier psychological era and neglect completely the work of other investigators which work is annotated in the bibliography of the book being reviewed.

Of the general diagnostic conclusions the following is an example:

> (*a*) Misses on the 10 easy Information items are characteristic for Schizophrenics, Depressives, Hysterics, and Neurasthenics. (*b*) An

> Information score far below the Vocabulary level is most characteristic for Involutional Depressives, Chronic Paranoid Schizophrenics, and Hysterics. The first two of these groups however suffer a general impairment of Verbal scores; but the general Verbal level of the Hysterics is well-retained, and the impairment of Information is thus outstanding. (*c*) A good Information (and Vocabulary) score, associated with impairment on other Verbal subtests, is characteristic of the Unclassified Schizophrenics and the Obsessive-compulsives. Such a pattern may also be present in Psychotic Depressives. (*d*) High weighted Information scores are most characteristic of the well-adjusted Normals and, among the clinical groups, the "intellectualizing" Obsessive-Compulsives and Over-Ideational Pre-Schizophrenics. Such high scores are rare or absent in Psychotic Depressions and in Hysterics (p. 146).

It is apparent to anyone who has attempted to explore by statistical means the test performances of clinical groups that this degree of differentiation is impossible to obtain statistically. That significance is claimed for so many differences in the present book should, in itself, suggest that the statistical methods used are questionable. It might well be argued that the present volume would have greater usefulness were it simply a handbook of clinical impressions, leaving to others the statistical validation of these impressions. Such a procedure would have the advantage of utilizing different subjects from those on whom these impressions were formulated.

Even though the statistics in this volume are presented only to "advance statistical proof for our views, derived from our clinical experience" (p. 34) it is impossbile to ignore what occupies such an appreciable number of pages and carries so much prestige in our culture. In an effort to understand the statistical methods employed, the data in Table 1-*B* (p. 59) were reworked. These data deal with the discrepancy between vocabulary score and performance score, which Rapaport calls "performance scatter." These data, he asserts, indicate that depressives show a greater discrepancy than do other groups. The table gives chi squares to assess the magnitude of "performance scatter" between the various clinical groups taken two at a time. Of 18 such chi-squares, if the standard conventions regarding the number of expected cases in each cell are observed, only one can be computed with three degrees of freedom as indicated, and only six more can be computed with even one degree of freedom. Of these six, one is said to be insignificant and remains so when recomputed with the proper number of degrees of freedom. One of the six is said to show a "strong trend approaching a significant differentiation" (p. 33). When recomputed with one degree of freedom, this probability figure drops to .30, or below any level of significance. The other four are said to be "highly significant" (p.

33). When recomputed, the respective probability figures are .50, .02, .01 and .01. That is, in Rapaport's terms one is insignificant, one "significant," and two remain "highly significant." Since the errors in this table are not consistent, it would seem that only by repeating all the calculations would one be able to interpret the tabular material.

When the depressive psychotics are compared with seven other groups, all these differences are in the direction of greater discrepancy between performance and vocabulary levels. Of the seven, five are given by Rapaport as significant. It was possible to recompute three of these, all of which remain significant. However, the mean age of the depressive psychotics is 49.9 years whereas the mean ages of the groups with which they are compared range from 28.3 to 46.9 years. The rank order correlation between the mean age of the 19 clinical goups and their mean "performance scatter" is $+0.59 \pm 0.15$. Hence it is apparent that the effect of age cannot be neglected, which point is stressed in several of the references making up the annotated bibliography to this volume.

Rapaport is of the conviction that "authors of clinical psychological publications are obliged to present raw data if their results, as statistically proven, are to become part of the used armamentarium of the clinical psychologist" (p. 32). This he does in the appendix. It is therefore possible to recalculate the values, using the age group of 30-39 years, into which decade of life age more members of the total population fall than in any other. As would be expected when dealing with the small groups used in this study, only one of the possible comparisons between clinical groups yields a "*t*" which is significant when age is controlled. Since the problem may be stated as that of determining which groups differ from the total population in this regard, "*t*'s" were computed contrasting each group with the total population excluding the group in question. When this is done, the greatest discrepancy is shown by the deteriorated schizophrenic group, next by the depressed psychotics, then the coarctated pre-schizophrenics, then the non-deteriorated unclassified schizophrenics. The "scatter" for each of these groups is greater than for the rest of the population exclusive of the group in question. The four groups do not differ significantly from each other. The non-depressed Patrol group shows significantly less "scatter" than does the rest of the total population. It is not possible to differentiate in any way between the other seven groups having sufficient members in this age range.

These findings should be compared with Rapaport's verbal summary of Table 1-B.

> It (Table 1-*B*) indicates that the most significant drop of the Performance level below the Vocabulary level is in the Depressive Psychosis groups; next come the Severe Neurotic Depressions and the Deteriorated Schizophrenias; next, the non-deteriorated Paranoid Schizophrenias; next, the non-deteriorated Unclassified Schizophrenias and, on the same level, the Neurotic Depressions; next, the Neurotic groups, and the subgroup of our Patrol cases showing depressive trends. The best of all our groups—that is, the group which has the least discrepancy between the Performance and Vocabulary levels—is the Patrol, excluding its depressive cases.

The rank order coefficient of correlation between this summary and the reviewer's findings with age controlled is $+0.51\pm0.27$, or less than twice its standard error.

The considerable time spent here in discussing these statistics, and the more considerable time spent in computing them, has been devoted to but one of the 113 tables. Nevertheless, because of the need for experimental validation of clinical variables, it would seem worthwhile to devote whatever time necessary systematically to work up the raw data in the appendix were it not for two difficulties which seem insurmountable. The items were not administered according to a standardized procedure and the diagnoses of clinical type were not independent of the psychometric results.

In summary, one is left with a feeling of disappointment at how far short of a systematic validation of clinical techniques this work has fallen. One is apprehensive at the use an inexperienced and credulous examiner might make of it. One deplores even that two volumes of *Diagnostic Psychological Testing* will be on the shelves of most psychiatric libraries to convey to our colleagues the idea that work in this field has progressed to the point where two volumes can be devoted to it. On the other hand, the book is full of research ideas. Anyone whose object is to find and not to tell can see here a hundred minor research problems for himself or his students. It is in the suggestive ideas presented, not in the theory or the statistical findings, that the contribution of the volume lies.

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Fleege, U. H. Self-Revelation of the Adolescent Boy. New York, Bruce, 1945. Pp. 384.

Flugel, J. C. Man, Morals, and Society. New York: International, 1945. Pp. 328.

Roheim, G. The Eternal Ones of the Dream. New York: International, 1945. Pp. 270.

Freud, A., *et al.* (*Editors.*) The Psychoanalytic Study of the Child. (An annual, Vol. 1.) New York: International, 1945. Pp. 423.

Simmons, L. W. The Rôle of the Aged in Primitive Society. New Haven: Yale Univ. Press, 1945. Pp. 317.

Morgan, H. K. Industrial Training and Testing. New York: McGraw-Hill, 1945. Pp. 225.

Bernhardt, K. S. Practical Psychology. New York: McGraw-Hill, 1945. Pp. 319.

Crow, L. D., & Crow, A. Our Teen-Age Boys and Girls. New York: McGraw-Hill, 1945. Pp. 366.

Baumgarten, F. Die Psychologie im Kaufmännischen Berufe. Zürich: Organisator, 1945. Pp. 159.

Abrahamsen, D. Men, Mind, and Power. New York: Columbia Univ. Press, 1945. Pp. 155.

Raven, J. C. Controlled Projection: A Standard Experimental Procedure. London: Lewis, 1944. Pp. (not numbered). (Distributed in the United States by The Psychological Corporation.)

Duvall, E. M., & Hill, R. When You Marry. Boston: Heath, 1945. Pp. 450.

Rockwood, L. D., & Ford, M. E. Youth, Marriage, and Parenthood. New York: Wiley, 1945. Pp. 298.

Harrington, M. The Management of the Mind. New York: Philosophical Library, 1945. Pp. 200.

Herr, V. V. How We Influence One Another. Milwaukee: Bruce, 1945. Pp. 266.

Brandt, H. F. The Psychology of Seeing. New York: Philosophical Library, 1945. Pp. 240.

Heath, C. W., *et al.* What People Are. Cambridge: Harvard Univ. Press, 1945. Pp. 141.

Beaumont, H. The Psychology of Personnel. New York: Longmans, Green, 1945 Pp. 306.

Lowy, S. New Directions in Psychology. New York: Emerson, 1945. Pp. 194.

Farrow, E. P. Psychoanalyze Yourself. New York: International, 1945, Pp. 157.

Gonzalo, J. Dinamica Cerebral. Madrid: Institute Cajal, 1945. Pp. 392.

Householder, A. S., & Landahl, H. D. Mathematical Biophysics of the Central Nervous System. Bloomington: Principia, 1945. Pp. 124.

Lewis, N. D. C., & Pacella, B. L., *Eds.* Modern Trends in Child Psychiatry. New York: International, 1945. Pp. 341.

Lecky, P. Self-Consistency. New York: Island Press, 1945. Pp. 154.

Wertheimer, M. Productive Thinking. New York: Harper, 1945. Pp. 224.

Blackburn, J. Psychology and the Social Pattern. New York: Oxford Univ. Press, 1945. Pp. 157.

Todd, L. P. Wartime relations of the Federal Government and the Public Schools, 1917-1918. New York: Columbia University, 1945. Pp. 240.

Wolberg, L. R. Hypnoanalysis. New York: Grune & Stratton, 1945. Pp. 342.

Masserman, J. H. Principles of Dynamic Psychiatry. Philadelphia: Saunders, 1946. Pp. 322.

Rapaport, D. Diagnostic Psychological Testing. (2 vols.) Chicago: Year Book, 1945. Pp. 573 & 516.

Harriman, P. L., Ed. Twentieth Century Psychology. New York: Philosophical Library, 1946. Pp. 712.

MacGregor, G. Warriors without Weapons. Chicago: Univ. Chicago Press, 1946. Pp. 228.

Parkes, J. Antisemitism. New York: Penguin, 1946. Pp. 160.

Mellett, L. Handbook of Politics. New York: Penguin, 1946. Pp. 144.

Faculty of University School. How Children Develop. Columbus: Ohio State Univ., 1946. Pp. 79.

White, J. G. Changing Your Work. New York: Association, 1946. Pp. 210.

Westover, F. L. Controlled Eye Movements versus Practice Exercises in Reading. New York: Teach. Coll. Columbia Univ., 1946. Pp. 99.

Sargent, W. E. Teach Yourself Psychology. London: McKay, 1946. Pp. 159.

Gerth, H. H., & Mills, C. W. From Max Weber. New York: Oxford Univ. Press, 1946. Pp. 490.

Walsh, J. F. Facing Your Social Situation. Milwaukee: Bruce, 1946. Pp. 237.

Bergler, E. Unhappy Marriage and Divorce. New York: International, 1946. Pp. 167.

Morgan, J. J. B. How to Keep a Sound Mind. New York: Macmillan, 1946. Pp. 404.

Save, K. J. The Warlis. Bombay: Padma, 1946. Pp. 280.

Walker, K. The Physiology of Sex. New York: Penguin, 1946. Pp. 183.

Moreno, J. L., *Ed.* Group Psychotherapy. New York: Beacon, 1946. Pp. 305.

Castiglioni, A. Adventures of the Mind. New York: Knopf, 1946. Pp. 428.

Munn, N. L. Psychology. New York: Houghton Mifflin, 1946. Pp. 497.

Guthrie, E. R., & Horton, G. P. Cats in a Puzzle Box. New York: Rinehart, 1946. Pp. 67.

Seward, G. H. Sex and the Social Order. New York: McGraw-Hill, 1946. Pp. 301.

Smith, B. L., Lasswell, H. D., & Casey, R. D. Propaganda, Communication, and Public Opinion. Princeton: Princeton Univ. Press, 1946. Pp. 435.

Johnson, W. People in Quandaries. New York: Harper, 1946. Pp. 532.

Maier, N. R. F. Psychology in Industry. Boston: Houghton Mifflin, 1946. Pp. 463.

Carmichael, L., *Ed.* Manual of Child Psychology. New York: Wiley, 1946. Pp. 1068.

Edwards, A. L. Statistical Analysis. New York: Rinehart, 1946. Pp. 360.

Link, H. C., & Hopf, H. A. People and Books. New York: Book Man. Inst., 1946. Pp. 166.

Teagarden, F. M. Child Psychology for Professional Workers. New York: Prentice-Hall, 1946. Pp. 613.

Orgel, S. Z. Psychiatry Today and Tomorrow. New York: International Univ. Press, 1946. Pp. 514.

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THE EFFECT OF EMOTIONAL AND MOTIVATIONAL SETS ON THE PERCEPTION OF INCOMPLETE PICTURES*[1]

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ELINOR VERVILLE

A. INTRODUCTION

Many of the factors influencing perception of an object at a given time have been investigated extensively by psychologists. The characteristics of the perceived object, the presence of other stimuli, verbal suggestion, experiential set, and numerous other variables affecting perception have been studied carefully for many years. Singularly neglected in the experimental laboratory, however, has been the effect of emotional and motivational set of the subject on his ability to perceive accurately.

This experimental neglect of the relationship between emotion and perception does not imply a lack of recognition by psychologists of its importance. Writers of legal psychology texts have emphasized the strong influence of emotion on perception, and generations of college students have witnessed the influence of emotion on perception in classroom *Aussage* demonstrations.

Laboratory work in this field, however, is limited to an exceedingly small number of rough, observational studies, such as those of Sherif (7) and of Murray (5). Sherif found that a subject made autokinetic perceptions to the right or to the left, depending on which direction was rewarded by the experimenter. Three of Murray's five subjects, who were young girls, rated pictured faces as more "malicious" after they had played two games of "Murder" than they did after they had enjoyed a picnic.

In the present study, more rigorous experimental procedures were followed to determine the effect of various emotional and motivational sets on the speed with which incomplete silhouettes of common objects were perceived correctly. Similar perceptual material has been used by Street (8) and by Leeper (3). Street attempted to determine if there was any relationship between intelligence and ability to perceive incomplete pictures correctly, and Leeper studied the effect of verbal and visual aid on their perception.

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[1] This work was supported in part by a grant from the Special Research Fund of the University of Wisconsin. The writer is indebted to Dr. Norman Cameron for continued guidance during the conduct of this study.

Using an original set of incomplete pictures in a study of age and sex differences in adult perception, Verville and Cameron (11) observed that there were emotional reactions of the subjects to the testing situation and their performance in it. Some subjects believed they would not have the ability to do well; others thought the experiment would reveal detrimental facts about their intelligence and personality. Subjects who failed to perceive a figure correctly were sometimes slow in perceiving the following picture, or failed completely to see it correctly. A few subjects, who discovered that some information was given about the picture if it had not been identified correctly within five minutes, remained silent for this time, waiting for confirmation of the correctness of their first impression before voicing it.

To determine whether emotional attitudes like these influence the ability to perceive incomplete pictures, subjects were given several tasks, intended to produce an emotional set, before they were tested with the incomplete pictures. The five emotional sets studied were tension, complete failure and frustration, failure according to false norms, success according to false norms, and the reaction to pretended personality testing.

B. Materials and Method

Nine incomplete silhouette pictures of common objects were the perceptual test material (Figure 1). Since the drawings had been used in the previously mentioned study (11), no subject in the earlier experiment served in this one. The drawings had never appeared in print or in any other way been made accessible to the subjects. A practice picture, that of the airplane, was shown prior to the test series to demonstrate what was meant by an "incomplete picture." The nine test pictures, in the descending order of difficulty in which they were presented, were of a steamshovel, a steamship, a child on a sled, two boxers, a cowboy on a horse, a horse-drawn sleigh, a piano, a frog, and a car. This order was determined by the reaction times of 50 University of Wisconsin women to the same pictures in the earlier study.

Projected on a translucent glass screen, each picture measured 7" x 4¾". A single switch flashed the picture on and off the screen and started and stopped a noiseless electric stop-clock which timed exposures in fifths of a second. The subject sat four feet from the screen in a small, sound-treated and air-conditioned room. The overhead light in the subject room and a small light placed behind the screen minimized after-images. Black cloth extending a foot on each side of the screen made it possible for the experimenter, in a darker room, to observe the subject without being seen.

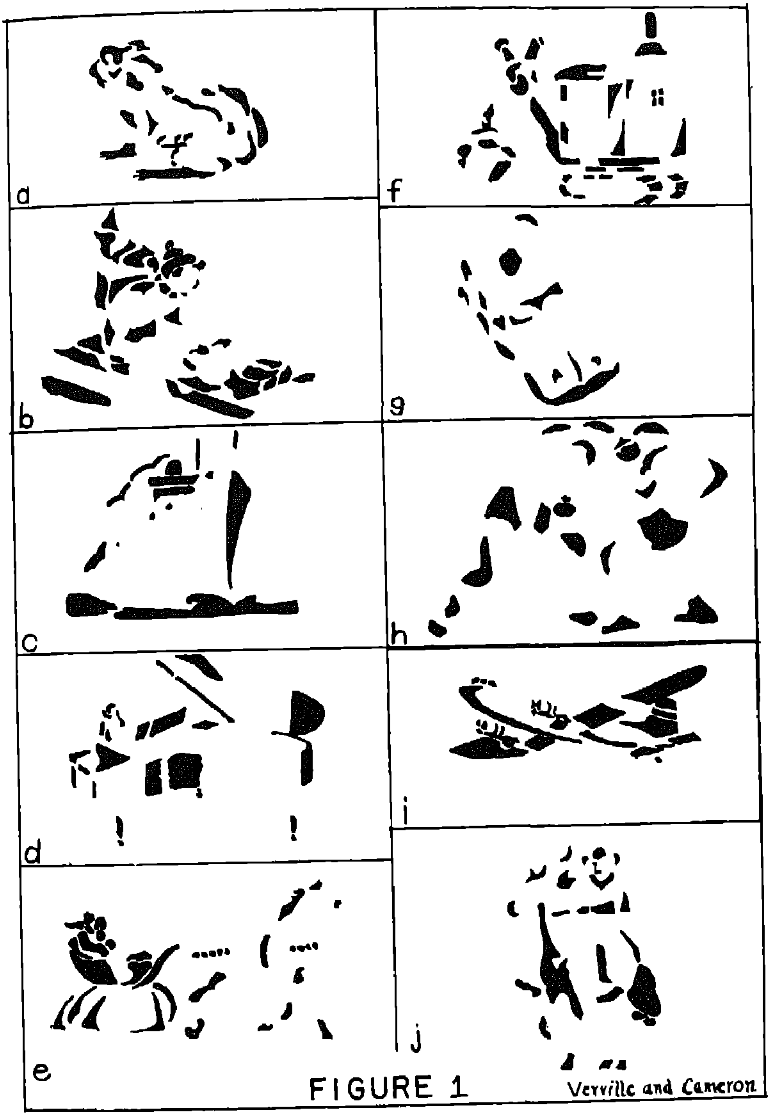

FIGURE 1

Verville and Cameron

The subjects were 150 women students at the University of Wisconsin. Their ages ranged from 16 to 24 years and their university classification from freshman to graduate. The median subject was 20 years old and a junior in the university. There were 25 subjects in each of the five experimental groups and in the control group, and the groups were built simultaneously to eliminate the effect of constant diurnal and seasonal factors. Performance of the preliminary tasks by subjects in experimental groups took about 30 minutes.

Control Group

After each subject was seated, her age and classification were recorded and she was read these instructions:

> I'm going to show you a number of incomplete pictures of common objects. As soon as you recognize the object, name it immediately. The picture will then be turned off and you will be told whether you were right or wrong. If you were right, I will say "Ready," and show you the next picture, which you will name as soon as you recognize, and so on. If you were wrong, I will say "Ready" and turn the same picture on again. You will again name the first thing you see, providing it is not the same thing you saw before, which was wrong. I will say "Ready" before turning on each picture. Do you understand? . . . The first picture will be just for practice. Ready. . . .

The picture of the airplane was then shown, but the reaction time to it was not recorded. If the subject became discouraged because she could not identify a picture, she was told, "Keep looking and you'll see it." Otherwise, no answer was made to comments or questions. When a subject failed to identify a figure correctly within five minutes, the next picture was shown. All interpretations and the time at which they were made were recorded.

Tension Group

Each subject in the tension group was told that the experiment dealt with attention and habit. With a tapping board before her, the subject was asked first to tap simultaneously with styli five times with the right hand and twice with the left hand in time with every second beat of a metronome. The metronome was set at 78 strokes a minute. After one minute, the subject was told to tap five times with the left hand and twice with the right; and after another minute to cross her hands and tap three times with the left hand and four times with the right in time with the metronome strokes. The second task was to multiply two-place numbers by two-place numbers without using pencil and paper while Walt Disney's "The Grasshopper and the Ant" and "Three Little Pigs" were playing from a loud-speaker two feet from the subject's chair. Next, she was asked to write one Mother Goose rhyme while reciting another aloud. Four of these combinations were given. Finally, the subject was told to learn simultaneously a 200-word story and a multiple-*U* finger maze with 15 choice points. The story was read and recited aloud by the subject, who was required to keep her finger moving through the maze continuously. She was kept working at this task for 10 minutes, and then shown the incomplete pictures. The instructions given to the subjects in the control group were repeated for each subject in the experimental groups.

Complete Failure and Frustration Group

Each subject in this group was told that the experiment was concerned with problem solving, and she worked 10 minutes at each of three insolvable tasks. The first task was to trace with a pencil the path which should be followed by a person going once, but only once, through each door of a diagrammed house. There was no solution to the problem. Next, the subject was told to learn a stylus maze of Hampton Court design to a criterion of one errorless run. Since the exit had been blocked, it was impossible for the subject to find her way out of the maze even once. The final problem was a cross-word puzzle of 27 three-letter words. The "definitions," however, had been selected abitrarily from a dictionary and the performance of preliminary subjects showed that not more than three words could be filled in. The incomplete pictures were then shown to the subject.

Failure by False Norms Group

A table of fictitious norms was before the subject throughout the testing and was handed to her to read after her own score on each test was announced. The table gave fictitious average scores supposedly made by college freshmen, college seniors, Phi Beta Kappas, Greek letter groups, and non-affiliated groups on the same tests which the subject took. These scores were set high enough so that the subject's score would fall considerably below the average for the college freshmen on every test. The subject was told that the experiment dealt with accuracy of perception. First, she was shown 20 2" x 2" pieces of wallpaper, each pasted on a small card, and asked to identify them in a recognition series of 20 presented later. None of the designs in the first series appeared in the second, and the subject was given an arbitrary score of 50 per cent correct. The second task was to answer 39 questions about a colored, detailed picture after one minute's study. Next, the subject was instructed to correct all the errors she could find in a mimeographed 300-word story. The final task was to reproduce from memory, after five minutes' study, a group of five geometric designs, each containing squares, triangles, semi-circles, circles, and parallelograms in five different colors. The subject was then shown the incomplete pictures.

Success by False Norms Group

The same type of norm table used for the failure by norms group was presented to subjects in the success group. Fictitious average scores for the tasks they were given, however, were set so low that these subjects were able to score above the purported averages of college seniors and Phi Beta Kappas on every test. The subject was told that the experiment dealt with speed in intellectual tasks. The first task was to learn a multiple-*U* finger maze with seven choice points to a criterion of one errorless run. Next, a mimeographed story was given the subject to study for five minutes, and she was asked to reproduce the principal ideas. She was told then to write the names of as many of the 48 states as she could in five minutes. Finally, she was given five minutes to learn 12 symbols, and then required to use the symbols in place of the words they represented in copying a story. All of these tasks were made as simple as possible without arousing the suspicion of the subject that they were artificially easy. Scores she obtained were reported higher than they actually were by the experimenter whenever this was necessary for apparent success. Usually, however, a subject was able easily to score higher than the false average listed for the Phi Beta Kappas in the norm table.

Personality Testing Group

Each subject in this group was told that the experiment was concerned with personality and motivation, and that she should be sure to answer just as honestly as she could all the way through. She was shown first 10 ink blots for her interpretation. Next, a set of 10 pairs of words was presented, and the subject asked to tell which of the two words she liked the better. The same procedure was followed for pairs of activities and pairs of pictures. The subject was then asked to look at a picture of a Flying Fortress caught by a searchlight, and tell everything the picture made her think of. Finally, she was asked to free associate to each of five words. All responses were recorded without comment by the experimenter. The subject was then shown the incomplete pictures.

After a subject in any of the five experimental groups had been shown the incomplete pictures, she was asked several questions in an effort to determine whether an appropriate emotional set had been produced by the preliminary tasks. In the success and failure groups, if there was doubt that an emotional attitude had been established, the subject's data were eliminated from the group record and another subject was tested in her place.

C. RESULTS

Since most of the responses were made quickly, use of the reaction times as data from which to compute significant differences would be an incorrect statistical procedure, since they formed a curve skewed to the right. Therefore, the reaction times were converted into point scores according to the frequency of their occurrence, in order that the skewness might be minimized as much as possible. The lowest reaction time score obtainable was *one*, given if the subject responded correctly in 1.5 seconds or less, and the highest score was *eight*, assigned to a subject who failed to respond correctly within the five minutes the picture was exposed. Fisher's *t* was computed for the reaction time scores of the subjects in each of the six groups for each picture and for the average score for the set of nine pictures. Of the 39 significant differences found, 13 were significant at the 1 per cent level of confidence or better, 11 at the 2 per cent level of confidence, and 15 at the 5 per cent level of confidence. The significant differences are given in Table 1, with the group reacting more quickly listed at the top of the table.

TABLE 1

SIGNIFICANT *t* VALUES BETWEEN THE GROUPS FOR EACH PICTURE AND FOR THE MEAN OF THE SET OF PICTURES**

	Control	Success	Failure by norms	Tension
Failure by norms	*2.05 piano			
Tension	†2.81 boxers	†3.50 boxers *2.02 cowboy	*2.12 boxers	
Complete failure	*2.59 set mean †2.86 shovel §2.43 ship *2.06 sled *2.12 boxers	§2.66 shovel §2.69 boxers †2.82 cowboy	§2.42 shovel *2.14 ship *2.08 frog	§2.58 ship
Personality	†4.08 set mean *2.24 shovel *2.40 sled †2.82 boxers §2.66 cowboy *2.44 sleigh †3.28 piano †2.82 car	†3.61 set mean *2.03 shovel †3.49 boxers †4.38 cowboy §2.54 sleigh §2.50 piano	†3.29 set mean *2.14 boxers §2.64 cowboy *2.19 sleigh †2.82 frog	§2.63 set mean *2.09 ship §2.59 cowboy

**The more quickly reacting groups appear at heads of columns. The more slowly reacting groups are given in the left hand column.

*Difference significant at the 5 per cent level of confidence.

§Difference significant at the 2 per cent level of confidence.

†Difference significant at the 1 per cent level of confidence.

There were no significant differences between the reaction time scores of the control and the success group, nor between the success and the failure by norms group, all reacting quickly. There were no significant differences between the complete failure group and the personality group, the slowest reacting groups. Subjects in the tension group reacted more quickly than did those in the complete failure group and the personality group, but more slowly than those in the control, success, and failure by norms groups. Most of the significant differences were between the quick control, success, and failure by norms groups and the slow complete failure and personality groups.

The relative difficulty of the pictures was not the same in the six groups, nor was it the same for any group as the order in which the pictures were shown. This order was approximated most closely by the complete failure group. The pictures are ranked in descending order of difficulty in Table 2, according to the mean reaction time score for each group.

TABLE 2
DIFFICULTY OF PICTURES ACCORDING TO MEAN REACTION TIME SCORES

Tension	Complete failure	Failure by norms	Success by norms	Personality	Control
4.60 boxers	5.44 shovel	4.20 shovel	4.00 sled	5.12 cowboy	3.92 shovel
4.36 shovel	4.56 sled	4.08 sled	3.96 ship	4.96 shovel	3.68 sled
4.32 sled	4.36 ship	3.60 cowboy	3.96 shovel	4.76 sled	3.48 frog
		3.60 boxers	3.80 frog		
3.68 cowboy	4.32 boxers			4.64 boxers	3.44 cowboy
3.40 sleigh	4.24 cowboy	3.04 sleigh	2.96 cowboy	4.32 frog	3.16 boxers
3.24 frog	3.80 frog	2.96 ship	2.96 boxers	4.12 ship	2.88 sleigh
2.80 ship	3.32 sleigh	2.68 frog	2.80 cowboy	4.00 sleigh	2.72 ship
2.36 frog	2.52 piano	2.52 car	2.48 car	3.08 piano	1.88 piano
2.36 piano	2.28 car	2.44 piano	2.16 piano	2.64 car	1.76 car

D. DISCUSSION

It is evident from these results that previous success at other tasks did not produce reactions which were significantly quicker than those made by subjects who had no success experience. In fact, the control group reacted more quickly than any other group except the success group, from which it did not differ significantly.

Among the experimental groups, the two groups given spurious success or failure scores prior to testing with the pictures achieved significantly more rapid reaction time scores than the others. The lack of any significant differences between the success-by-norms group and the failure-by-norms group confirms the findings of Hurlock (2), Thorndike and Woodyard (9), Travis (10), and Wood (12), who reported no significant differences between subjects made to succeed or to fail with a variety of test materials. On the other hand, in this study, the complete failure group was significantly slower than the success group in perceiving three of the nine incomplete pictures. This result agrees with Sears' finding that subjects allowed to succeed at card-sorting performed better on subsequent tasks than did subjects forced to fail (6).

The contrast in performance of the two failure groups in this study calls for their further comparison. Overt reactions of the subjects in the two groups were similar. They were bewildered and embarrassed at their failure, and when questioned, said that they had done very poorly. Subjects in both groups needed consolation and encouragement from the experimenter at the conclusion of the experimental session.

The situations in the two groups were radically different, however, even though failure was experienced by both. In the *failure by norms* group the setting was distinctly a competitive one in which the subject knew her score would be compared with a table of norms, and therefore probably worked hard for a high score so that she might no longer be embarrassed by this comparison. She could always do her best and she always received a tangible score for her achievement. Many subjects in this group believed that they had done well and showed considerable surprise when their scores were compared unfavorably with the false norms.

In contrast to this, the subject in the *complete failure* group had no standard with which to compare, no scores for effort, and at the end of 30 minutes could show no achievement of any kind. She failed completely in every attempt she made, and the final task was so designed that a solution scarcely could even be attempted. Finding that she could succeed at nothing in this situation, and that everything she tried was too difficult for her, she apparently approached the incomplete pictures as just another impossible task.

The subject in the *failure by norms* group, however, began the test with the incomplete pictures under conditions of high motivation to better her standing, motivation which had been continuous during the previous half-hour, and which was apparently more powerful in influencing her performance than was discouragement caused by her previous poor showing. That this motivation may have been a contributing factor is suggested by Anderson and Brandt's finding that school children who scored low on cancellation tests set a higher level of aspiration for succeeding tests after comparison of their scores with those of others (1).

The perception of the tension group was not so quick as that of the control, success, or failure-by-norms groups, nor so slow as that of the complete failure and personality groups. It cannot be claimed that tension was the sole motivation, however, for only 15 of the 25 subjects admitted that they felt tense, and then not during all of the preliminary tasks. It is possible that a failure effect was produced for some subjects, since no one completed the final task in the 10 minutes allowed. Since there was a significant difference between the performance of the tension group and of every other group with at least one picture, some kind of motivating set was operating, although it cannot be identified accurately.

It would have been difficult to predict that the personality group would react as slowly as the complete failure group and more slowly than every other group to the entire set of pictures. Several explanations of this result can be suggested. The subjects may have been cautious and slow in responding because of an unwillingness to make mistakes which would reflect unfavorably on their personalities. This theory seems incorrect because there was little hesitancy about responding, and often subjects named many incorrect pictures in rapid succession. In the preliminary tests, these subjects did not seem to be embarrassed or worried.

Another possible explanation is that subjects in this group were not set for quick reacting, since their preliminary tasks had consisted of choosing, imagining, and describing. There was no score to be obtained, no time limit to be met, and no competition for performance excellence. Still another hypothesis is that attending to the ready signal was not so close as in the other groups, because subjects were thinking about what had happened before and what their responses might mean to the experimenter.

In an effort to eliminate some of these hypotheses and to learn more about the factors producing the slow reactions and failures of the personality group, an exploratory experiment was conducted. Twenty-five women students were shown the incomplete pictures under the same conditions as those of the control subjects, except that the regular instructions were preceded by the opening statement made to the personality group: "This experiment is concerned with personality and motivation, and you should be sure to answer just as honestly as you can all the way through." A comparison of mean reaction time scores between this group and the original personality group showed that there was only one difference, significant at the 5 per cent level of confidence. This difference was a slower reaction by the original personality group to the picture of the cowboy, the incomplete figure which was the most difficult of all for this group (Table 2). Apparently, then, the mere statement that the test is one of personality is sufficient to change subject's ability to perceive an incomplete picture. Careful questioning of the subjects in this check group revealed no tendency to day dream, to worry about the results of the test, or to try to figure out what the test was showing.

Relative difficulties in perception of individual pictures varied from group to group. The difficulty rank of four of the nine pictures changed markedly in one or more of the six groups from the order in which they were shown. The picture of the steamship, shown as the second most difficult picture, ranked sixth for the failure by norms and personality groups, and seventh for the tension and control groups. In the previous test series, on which the order of difficulty used in this experiment was based, the picture of the steamship was preceded by that of the child and sled. The shift from perceiving a small object to perceiving a large one is perhaps one reason why the steamship was difficult for the earlier subjects to see. In this experiment, the preceding picture was of the steamshovel, a large object necessitating simultaneous grasp of all parts for accurate perception. Set established by this picture perhaps aided subjects to perceive more readily the large, disconnected figure of the steamship than did the first subjects, who saw it as a seascape rather than as a single object.

The picture of the boxers, originally ranked fourth in difficulty, was the most difficult of all for the subjects of the tension group; and the picture of the cowboy, shown as fifth in difficulty, ranked first for the personality group. There seems to be no satisfactory explanation for the difficulty of these particular pictures for the two groups.

The picture of the frog, originally ranked eighth in difficulty, rose to a rank of five for the personality group, four for the success group, and three for the control group. In the earlier series, in which the picture was quickly identified, the frog was the first picture shown, so that there was no set from a previous picture. In this experiment, however, the picture of the frog was preceded by that of the piano. Since the drawing of the two pictures was the same size, it seems probable that subjects had difficulty perceiving as small an object as a frog after seeing the piano. They said the picture was a man running, deriving this interpretation from a part of the frog's leg, or they sometimes called it a chaise longue.

Problems raised by the results of this study fall into three categories. Since kinds of failure are important in determining subsequent perception of incomplete pictures, further comparative failure studies, with both familiar and novel subsequent tests, should reveal whether a general differential effect exists. If there is no general effect, and this seems indicated as far as present experimentation has gone, then some explanation of the selective effect of the two kinds of failure on perception of incomplete pictures is needed.

The markedly slow reaction of subjects who believed that personality was being tested suggests that motivation of this kind needs evaluation both by personality testers and by psychologists conducting other kinds of laboratory experiments in which results might be altered because of the presence of this motivation. Attitude studies, as well as experimental work, may reveal more of the operating components of motivation produced by the knowledge that personality is being examined.

Since the relationship between emotion and perception can be investigated in the experimental laboratory, perceptions more akin to those encountered in every day observation may well be substituted for perception of incomplete pictures. Use of auditory and tactual, as well as visual, perceptions in laboratory tests would also increase accurate knowledge of the effects of emotion and motivation on perception. and might result in the formation of applicable, general principles.

E. SUMMARY

1. Nine incomplete silhouette drawings of common objects were projected in descending order of difficulty on a small glass screen for recognition by 150 women college students. The subjects were tested individually.

2. Each of the 25 subjects in an experimental group was required to perform tasks for 30 minutes prior to looking at the incomplete pictures. There were five experimental groups, and the preliminary tasks were designed to produce the five emotional sets of tension, complete failure and frustration, failure according to false norms, success according to false norms, and the reaction to personality testing. The remaining 25 subjects served as controls, and were given no tasks prior to their testing with the incomplete pictures.

3. Most of the 39 significant differences found were between the quickly reacting control, success, and failure-by-norms groups and the slowly reacting complete failure and personality groups.

(*a*). There were no significant differences between the reaction time scores of the control group and the success group.

(*b*). There were no significant differences between the reaction time scores of the success group and the failure-by-norms group.

(*c*). There were no significant differences between the reaction time scores of the complete failure group and the personality group.

(*d*). Subjects in the tension group reacted more slowly than those in the control, success, and failure-by-norms groups, but more quickly than those in the complete failure and personality groups.

4. Since the mean reaction time score of the personality group for the set of nine pictures was significantly slower than that of every other group, except the complete failure group, an exploratory study was made to find the factors operating. Subjects were shown the incomplete pictures under the same conditions as those of the control group, except that they were told that the experiment was concerned with personality. This group showed no significantly quicker reactions than the original personality group to eight of the nine pictures.

5. Although in general, individual pictures maintained roughly their rank of difficulty, previously determined by the reaction time of 50 women college students to them, there were some marked position reversals.

REFERENCES

1. ANDERSON, H. H., & BRANDT, H. F. Study of motivation involving self-announced goals of fifth-grade children and the concept of level of aspiration. *J. Soc. Psychol.*, 1939, **10**, 209-232.
2. HURLOCK, E. B. The value of praise and reproof as incentives for children. *Arch. of Psychol.*, 1925, **11**, No. 71. Pp. 78.
3. LEEPER, R. A study of a neglected portion of the field of learning: the development of sensory organization. *J. Genet. Psychol.*, 1935, **46**, 41-75.
4. LINDQUIST, E. F. Statistical Analysis in Educational Research. Cambridge: Houghton Mifflin, 1940.
5. MURRAY, H. A., JR. The effect of fear upon estimates of the maliciousness of other personalities. *J. Soc. Psychol.*, 1933, **4**, 310-329.
6. SEARS, R. R. Initiation of the repression sequence by experienced failure. *J. Exp. Psychol.*, 1937, **20**, 570-580.
7. SHERIF, M. A study of some social factors in perception. *Arch. of Psychol.*, 1935, No. 187.
8. STREET, R. F. A Gestalt Completion Test. New York: Bureau of Publications, Teachers College, Columbia Universiy, 1931.
9. THORNDIKE, E. L., & WOODYARD, E. The influence of the relative frequency of successes and frustrations on intellectual achievement. *J. Educ. Psychol.*, 1934, **25**, 241-250.
10. TRAVIS, R. C. Comparison of the influence of monetary reward and electric shocks on learning in eye-hand coördination. *J. Exper. Psychol.*, 1938, **23**, 423-427.
11. VERVILLE, E., & CAMERON, N. Age and sex differences in the perception by adults of incomplete pictures. *J. Genet. Psychol.* (In press.)
12. WOOD, T. W. The effect of approbation and reproof on the mastery of nonsense syllables. *J. Appl. Psychol.*, 1934, **18**, 657-664.

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IMAGINARY COMPANIONS AND RELATED PHENOMENA*

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A. LITERATURE

The subject of imaginary companions appears very early in our psychological literature. There are at least three references to this topic in the 1890's. Studies since that time are few in number considering the universality and popular interest of the phenomenon. Moreover, though they have become more systematic and detailed, they have not appreciably advanced our understanding of the subject.

Typical of the early studies is that of Burnham (6) who in 1892 gave a clear exposition of the phenomenon when he said:

> All children, unless they be idiots, probably have productive or creative imagination in some measure; and among them the differences in degree are much greater and more important than is usually supposed. . . . Those who have such remarkable productive imagination live in a mental world as unlike that of the ordinary prosaic person as the world of a deaf mute is unlike that of a person with all his senses. The differences in degree are so great that they have become differences in kind.
>
> Such imaginative children not only have imaginary playmates, and personate animals and men, sometimes doing grotesque or outlandish things for the sake of playing their rôles, but they almost reconstruct ideally the world in which they live. Beasts, birds, and their food and furniture talk to them. . . . They have play brothers and sisters and dear friends with whom they talk. . . . Even the prosiest things are vivified (p. 212).

Vostrovsky (24), in 1895, is the first to suggest that general temperamental differences, other than the possession of a marked amount of imagination, may be responsible for the appearance of imaginary companions. She also suggests reason for these phenomena which are very similar to those given in our current literature.

> Of the 46 papers (reviewed) 40 describe people and but five animals, and one both animals and people. Children of the same sex seem to be preferred. . . . Turning to what concerns more nearly the child

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> having the companions, we find a child of a nervous temperament, who is thrown largely on his own resources, most susceptible to them. Three things play a prominent part in causing these playmates: desire for self aggrandizement, desire for company, sympathy and desire to help others (p. 396).

Two detailed early reports of the course of the imaginative life of individual children are those of Swett (22) and of Nice (19). Swett reports the imaginary companion, "Little Girl" of one Child *C*. This case emphasizes the "moral" aspect frequently observed in connection with imaginary companions, in that "Little Girl" punished *C* severely whenever *C* was bad.

Nice's account describes a child whose imaginative life was equally vivid but more varied. This case is particularly interesting as illustrating concretely the close sequential relationship between imaginary play, imaginary playmates, and imaginary stories:

> 2^{9}: "A great big lion is comin' in. . . . A skunk borrowed your watch," etc.
>
> 3: "We're playing we're two little boy witches." Frequently pretended that she and the baby were foxes, frogs, rabbits or skunks.
>
> 3^{6}: Pretended she had some babies down cellar and was playing with them. Said they went to school. Finally they grew up and had some babies of their own. Also there was a "'haneater," an imaginary bird. "It eats hands what are broken off of killed people. I can pat and pat it." It seemed to be a large rooster, white with some black and red on it. "A mudder can't leave her babies. A mudder Haneater and baby Haneaters are gentle. Dey don't peck people." Later she asked her mother why they were called Haneaters. Mother told her that she (the child) had named them herself, whereupon the child said, "Perhaps I sought it was a pretty name." The haneater lasted about 9 months.
>
> 4^{10}: Started telling very elaborate stories about animals. About a dog named "Bow-wow" and a lamb named "Larvee."
>
> 5^{4}: Still stories about Bow-wow and Larvee. Also began imagining some creatures called the Housekins, "horrible little creatures that ate our food and pinched people. . . . They just live in houses. The only thing they help about is telephoning. If you make a mistake they run and telephone. They are great climbers. They are good: they do some damage and some good. The tree housekins are the ones that pinch." This continued for a month.
>
> 6: Elaborate stories about different characters. A whole set about her Stars: Cattle Star, Bird Star, etc.
>
> 8^{6}: End of imaginary playmates and end of imaginative story-telling.

Nice notes that on three occasions this child's creative moods were apparently stopped by an increase in the interest of real life, while twice they gradually became less and less absorbing although no special change in environmental conditions was responsible.

More recent studies differ from these earlier ones chiefly in that they are based on larger numbers of cases and give tabular presentation of data. One of the most thorough systematic investigations is that of Hurlock and Burnstein (13). This is a study in which 701 adults were asked by means of a questionnaire to recall their childhood experiences, if any, with imaginary playmates. The method of this study probably accounts for the fact that the age placement of these phenomena is much later than that of other studies. These authors found that 31 per cent of the women and 23 per cent of the men remembered having imaginary playmates, and that the background of individuals who experienced these phenomena did not differ markedly from the background of those who did not. They present a valuable series of facts about the companions, dealing with the age of children when these companions first occur; and age, sex, and general characteristics of playmates and manner in which the child treats them, as well as a summary of the literature to date.

Svendson's 1934 study (21) deals almost exclusively with imaginary companions and does not consider closely related phenomena such as changes of personality. She found an incidence of 13.4 per cent among children observed. There appeared to be no special physical characteristics among children displaying this phenomenon, but she did find what she considered to be personality difficulties in some form in 35 of the 40 selected children, timidity heading the list. Thus she indicates that reports from mothers "point to possible constitutional differences" (between children who have companions and those who do not) "rather than to conspicuous differences in opportunities for companionship—those who had imaginary companions being regarded as more timid in their approach to other persons" (p. 992).

The most recent paper on this subject is that of Bender and Vogel (2), who present in some detail 14 cases of imaginary companions among non-psychotic children aged 6½ to 10 years of age, on the Children's Ward of Bellevue Psychiatric Hospital. They comment that these cases do not resemble each other but that each is as different as the personality of the child in question. They consider that the creation of companions in phantasy is a positive and helpful mechanism used during a time of need but immediately given up when the need no longer exists.

In general there is agreement in the literature that more girls than boys experience these phenomena; that the usual age for their occurrence is from 2½ to 5 or 6 years, and that they customarily drop out at about the age of school entrance. They occur most frequently in only-children of superior intelligence and with limited opportunities for companionship. Imaginary companions are found to be usually of the same sex as the child, and older than the child. Commonplace names predominate though some are very imaginative. The rôle played by the companion is usually that of friend, subordinate or scapegoat, or ideal self. The analytic literature stresses the idea that imaginary companions furnish outlets for aggression and guilt trends, feelings of guilt and inferiority, hostile impulses toward members of family, or that they personify id-impulse, ego-ideal, or super-ego. The companions may be animals, individual people, or whole families. Some children are secretive about their companions; others share them openly.

B. THE PRESENT INVESTIGATION

1. *Subjects*

Subjects of the present investigation are 210 children who have been recently studied at the Yale Clinic of Child Development. One hundred and ten of these are the children enrolled in the Guidance Nursery during the two years 1942 and 1943, children aged from two to four years. One hundred research cases have been added from the files of Dr. Frances Ilg, cases seen chiefly in connection with her guidance service. Records on these cases were available from 2-3 years up to 5-10 years of age. Each of these children was given from one to 11 developmental examinations.

2. *Data*

Data on imaginary companions were gathered chiefly during the course of parent-interviews or by direct observation of the children at play. No special questionnaire was used in regard to imaginary companions, though such a questionnaire might have yielded more cases where these phenomena occurred.

Material which dealt with any of the four following types of phenomena which appears to involve some use of the imagination was then analyzed:

a. Imaginary companions, animal and human.
b. Impersonation of animals or of other humans.
c. Animation or personalization of objects.
d. General imaginative play.

3. *Purpose of This Study*

The present paper aims to present the main types of imaginative behavior commonly observed in the preschool child, to show their developmental normality, and to indicate the temporal relationship of each of these types to the others. Detailed information and examples will be given in regard to imaginary companions and each of the other common imaginative phenomena. Present findings will be compared with those in the literature.

We shall then investigate further the suggestion found in the literature that the temperament or personality of any given child is to some degree responsible for the imaginative behavior which he expresses.

C. FINDINGS

Data will be presented, in semi-tabular form, first for all these imaginative phenomena grouped together, and then separately for each of the chief types of imaginative behavior.

1. *All Types of Imaginative Behavior Considered Together*

a. Incidence. Of 210 cases studied, 45 children (21 per cent) gave evidence of having imaginary companions or of exhibiting changes of personality. Probably the incidence is actually greater than this. Frequently, we believe, parents are not aware of these phenomena.

b. Sex and age of child. Of these, 22 were boys, 23 were girls.[1] These phenomena occur chiefly between 30 and 54 months, with the following number of cases exhibiting them at each age: 30 months, 18; 36 months, 28; 42 months, 41; 48 months, 23; 54 months, 8. Thus 36-48 months appears to be the outstanding age for such behavior, with 42 months definitely the leading age.

c. Position in family. Nearly half of our subjects, 21, showing these phenomena were "only-children." The same number had one sibling only, usually a sibling two or three years younger. One child had two siblings. Our subjects for the most part come from a small family population; but these findings agree with most of the literature, that most such subjects are only-children or have only one or two siblings.

d. Opportunities for companionship. Though most of the children had no siblings or only one, many had opportunities for play with other children. The actual lack of companions may frequently have stimulated the appearance of imaginary companions, but often these occurred in children who had many real playmates. Very often, however, the child's own temperamental inability to play satisfactorily with other children (see Section *D*) more than the actual lack of children in the neighborhood, seems to have caused the need for imaginary companionship.

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[1] Variations of sex and ages of subjects with regard to each of the separate phenomena are presented in descriptions of each of the phenomena. Earlier findings that more girls than boys experience these phenomena are not entirely accurate if the different types of imaginative behavior are considered separately. Many more boys than girls, for instance, impersonate animals or have animal playmates.

e. Intelligence of child. Of children exhibiting these phenomena, 12 are Very Superior (as measured on the Gesell Scale); 26 are Superior; 6 are High Average; one Average. However, our total group is somewhat skewed toward the higher intelligence levels.

f. Duration of these phenomena. The average duration is six months (30 cases continue this long). A few continue for one or one and a half years. It is unusual for any one companion to continue longer than this, though any one child may have a series of different companions. The most usual duration is from 36 to 42 months, or from 42 to 48 months.

g. Number of different imaginary phenomena in any one child. Though many of these subjects exhibited only some one of the phenomena in question, not infrequently, as Table 1 indicates, several were observed in one child.

h. Purpose served. This problem is discussed at length in the section on Imaginary Human Companions (p. 154).

TABLE 1

NUMBER OF CASES EXHIBITING INDIVIDUAL OR COMBINED PHENOMENA

- Total having imaginary companion: 41
  - No. having imaginary animal companion: 11
  - No. having imaginary human companion: 30
- Total showing change of personality: 17
  - Impersonates an animal: 8
  - Impersonates a human: 9
- Have imaginary animal only: 5
- Have imaginary human companion only: 19
- Imaginary change of personality only: 9
- Have both animal and human companions (only these two): 5
- Have human companion and change of personality: 4
- Have animal; human companion; change of personality: 2
- Have an imaginary object: 1
- Animates inanimate objects: 3
- Personalizes objects: 2

2. *Children Who Have Imaginary Animal Playmates*

a. Incidence. Five children have imaginary animal only; six have animal as well as human playmate.

b. Sex and age of child. Five girls; six boys. Age is chiefly from 30 to 42 months, with the peak at 42 months, twice as many occurring at that age as at any other.

c. Kinds of animals. Snakes, roosters, owls, foxes, birds, bears, kitty, tiger, worms, pig, chipmunk, dig-a-dig chicken, cat, dog, wolf.

d. Activity or emotions toward animal. Only two fear the animals. Six play with them in a friendly way. Most of the animals persist over a period of time but do not necessarily have special names or consistent personalities. One child has a persisting animal with the name "dig-a-dig chicken" (see example).

Imaginary animals often first develop at night, then carry over into the daytime. Often sleep or hide under the child's bed, but may get into the bed. Thus one child reported in the morning, "Kitty pushed me with his paw in the nose, and then I laughed."

> *Example: Boy RJ, high average intelligence, an only child.* From 30 to 48 months he had an imaginary playmate, "dig-a-dig chicken." This chicken was as big as daddy or so tiny you could put him in tiny places. *RJ* talks a good deal about his chicken and plays with him. He built him a house which he wouldn't allow anyone to knock down. "Dig's" last name was the same as the child's own. Dig had a little boy. Whenever the family went anywhere, *RJ* asked if he could bring Dig along. Whenever he did anything wrong himself, he blamed it on Dig.

e. In older children. Though our present data do not yield this information, we believe that both imaginary animal and imaginary human companions continue in many children during the years from 5 to 10. As a rule these companions are kept entirely secret, or are shared with some other child, but are not divulged to parents. The best source of information about such companions is the memory of the adult, who can remember back to his own childhood (Hurlock, 13). We include one example of this kind of imaginary companion.

> *Boy MC, very superior, second of two children.* He and his older sister had two bears, a mother and father bear. These bears were very real to the children, who were fond of them. The bears were for the most part friendly though sometimes they became dangerous. In this case, the children controlled them by rolling marbles at them, along the carpet.
>
> Finally one day the older sister told *MC* that the bears were dead. She had killed them with a large marble. He was horrified and cried, believing implicitly that the bears were dead.
>
> The source of these bears was a poem, recited by *MC's father*, a poem about "Algy met a bear." The bears were killed when *MC* was about six. He did not see the bears eidetically but they were very real to him and he saw them in his mind. The children did not tell their parents about the bears because they couldn't, owing to the fact that they played with the bears in a secret language. The bears were more real to them and more important than their father and mother. Perhaps the bears were in a way a mother and father who were very

kind to the children and granted all their wishes, yet who could be kept in hand and sent away whenever the children wished.

3. *Children Who Impersonate Animals*

a. Incidence. This occurs in eight of our cases. Probably it actually occurs in many others, but too briefly to have been recorded.

b. Sex and age of child. Six of these children are boys; only two are girls. The age range is chiefly 30 to 48 months. The behavior is strongest at 42 and 48 months.

c. Kinds of animals impersonated. The most common animal impersonated is a dog (three cases) or a cat (three cases); one child is a horse, one is a pig. Only one is a wild animal: "a great big grizzly bear." One is sometimes a dog and at other times a horse; one is alternately a cat or a dog. Two cases not included in our tabulations were, respectively, a mouse and a hen.

d. Extent of activity. Two children merely say they are animals and like to be addressed as such; two pretend a little more extensively but not systematically or consistently. Four carry out the pretense consistently: going around on all fours, saying "woof woof" or "meow" instead of talking, lapping up food from a dish on the floor, chasing automobiles, even urinating in animal fashion by standing on one leg. (Parents find this rôle more troublesome and harder to put up with than the other imaginative phenomena).

> *Example: Boy BT, superior, older of two children by 3 years.* At 24 months of age he visited his grandmother, who had a kitten. When he got home, he became a kitten and this continued quite consistently till he was 36 months old. He went around on all fours "meowing"; lapped up milk. At 30 months he took on, briefly, an additional rôle, that of his best friend's dog. In this rôle he went around on all fours and bit people.

4. *Children Who Have Imaginary Human Companions*

a. Incidence. Thirty children out of the 210 observed have imaginary companions. Nineteen of these children have only such companions; others have them in addition to some other or others of the imaginative phenomena.

b. Sex and age of child. Nineteen girls; only 11 boys. The strongest period for this particular phenomenon is from 36 to 42 months, with the peak at 42 months. The average duration is from six to 12 months. The playmate usually drops out, rather gradually, around 54 months if not before.

c. Sex and age of imaginary companion. The majority, 13, have playmates of both sexes. Five girls have girls only; eight girls have boys only. Three boys have girls only; only one boy has a boy only. (This does not agree with earlier findings that the playmate is most often of the same sex as the child.) The largest number, 16, have contemporary-age imaginary companions; 10 have companions older than themselves; six have them younger; two companions vary in age from time to time.

A clear developmental trend thus suggests itself in this respect. It appears that the very youngest children to have imaginary human companions have companions older than themselves. Later they have contemporaries. Still later they have babies or children younger than themselves. Thus of 10 children who have adult companions, the majority are 30 to 33 months of age. The average age for children who have contemporary companions is 42 months. Of the six children who have younger companions, the average age is 42 to 48 months. (Statements in earlier studies that the playmate is usually older than the child appear to be inaccurate over-generalizations.)

d. Number of human companions for each child. The largest number of children, 11, have one companion only; six children have two; six have three; five have more than this, one child being reported to have "innumerable" companions. Probably the actual number is greater than this, if temporary companions or ones not known to or remembered by the parent were included.

e. Sources. The majority come in spontaneously, perhaps from some name heard just once by the child. Most others come from real people. A few are just silly names the child likes the sound of; or come from story books.

f. Name of companions. Most have just ordinary names as Daddy, Miss L——, Jimmy, etc; a few have somewhat imaginative names as Rocky, Cocky, etc.; two have extremely imaginative names as Saukit, Shukey, Tooley. Sticky, Yuke-a-tuke, Tulipka, Bisslebambo, etc.

g. Purposes served:

16: general companionship and play
3: companion very smart; can do anything and not get hurt
3: companion very weak and is bossed around or cared for by child
6: allowed to do things child may not do
3: missing or non-existent family member
2: blamed by child for things child does wrong
1: conversational outlet, with adults
1: child has twins. The twin boy does all good smart things; the twin girl does all bad things. (Child is a boy)
1: action outlet, companion extremely active.

h. General characteristics. There is marked variety from child to child as to the characteristics of companions. With some, companions accompany the child almost constantly, take up space (i.e., a place at table, a seat in the car, etc.), and there may even be acute emotional distress if some one sits on them. Child may even seem to see the companion eidetically and companion is a part of the family group. Others occur more spasmodically and child may see them only in his imagination. Some are discussed with parents and others, and even shared; others are not discussed or shared. Only a few children bring imaginary companions to school. Duration, as indicated, is variable; also sex, size, and general character of playmate vary from child to child.

> *Example: Girl RP, superior, older of two.* Imaginary play started around 2 years. She animated her hands and had the fingers talk to each other, before she herself could talk well. Outdoors she used sticks as imaginary people. Later when she could talk she called her hands "hand-duds" when they were acting as imaginary companions. She dressed up her hands with ribbons between the fingers for hair.
>
> At 33 months she talked to imaginary beings in the corners of the room. She would sit at supper and make faces at the corner of the room near the ceiling. Had long conversations with this imaginary friend and was oblivious of the rest of the family. Would talk to the companion, and then make faces and slight grunting noises in her throat when other person was supposed to be talking to her.
>
> Her most familiar companions are *Hankea, Jellia* and *Honia.* Hankea is a little girl with a "hanky" around her head. Honia is full of honey, Jellia is full of jelly. Honia had a hole in her tummy and a door popped open and the honey popped out. Then all the bees came buzzing around and got the honey. In fact, that is how one gets honey. . . . Sometimes this child changes places with her imaginary companions and she is one of them.
>
> *Mama Shalter* seemed to have no derivation. She has lots of children. One of them is *Queen Penny.*
>
> *Adreas* is a child she knew in South America. She makes up long stories as she talks to him. Another one called *Trunker* has lots of trunks.
>
> *Spinchpen* is a very popular companion. His name may be derived from spinach. If she is awake at night she says Spinchpen has a bad cold and is coughing and keeping her awake. Blames things on him.
>
> *Ibarra* seems to come from the President of Equador or from the name of a town near her home in South America.
>
> *Two clowns* she once saw were taken home (imaginatively, though she had actually seen the clowns), and were kept in the guest room for a long time. She said they made dents in the bed where they slept. She was annoyed when guests came and the clowns had to move out of the guest room bed.

When *RP* was 30 months old a younger sister was born. At first *RP* resented this baby but later began to play with her sister more and the companions started dropping out. Also now that she has come to North America she has more real playmates than formerly. She sometimes talks to her companions when alone in her room at rest but now (she is 4 years old) she seems to have her tongue in her cheek a little about them though earlier they were extremely real to her and she probably saw them eidetically. She is more self conscious about them now.

5. *Children Who Impersonate Others*

a. Incidence. Nine cases.

b. Sex and age of child. Six girls; three boys. Age is chiefly 42 to 54 months, with the peak at 42 months. Behavior lasts about six months, but may go on for several years.

c. Characters impersonated.

Several (girls) pretend to be almost any other person as: a maid, mother, a playmate, a baby.

One is a playmate "Joan" or "Joan's mummy."

One is an older boy or an older girl in the neighborhood.

Another is "Bobby," a friend, "Daddy," or *all three* of the neighbor's children aged 3, 5, and 7 years. He is "Bobby" whenever he falls down.

One plays the rôle of twins, a boy and a girl, whom he actually knows.

One (a girl) pretends to be a boy. Has different boy's names, mostly "Jimmy."

Nearly all insist on being addressed by the name of the person they are pretending to be. Nearly all pretend to be at least several different people (at different times). These personalities may have names but are more flexible in name than are the imaginary playmates. Also less stereotyped as to personality.

Example: Girl DF, very superior, an only child. From 36 to 60 months she pretended to be a boy. Mostly she was a boy named "Jimmy" and would not answer if addressed by her own name. Would say, "My name is Jimmy." If any request were prefaced by "Jimmy, will you ——?" she would accede immediately. Sometimes she was some other boy than Jimmy. Occasionally when she did something she was not supposed to do she was Shisky.

She preferred to dress like a boy, in overalls. Would not wear dresses, except for a plaid skirt because the King of England wears kilts. Wanted to have her braids cut off. At 5½ years, when her mother suggested that toileting would be much easier if she didn't have on overalls, this impersonating a boy dropped out very suddenly. She put all her boy clothes away in a drawer and didn't even want to have the drawer opened. She became very feminine as to dress.

6. *Imaginative Play with Object*

A third type of imaginative play, in addition to having imaginary companions and to experiencing changes of personality, is play with imaginary objects and the animation and personalization of actual objects.

This type of play, even more than the two already described, stems out of a general matrix of imaginative play, common at two and especially at 2½ years of age. This play, described in more detail in Section 7, includes many different sorts of pretending play which utilize imaginary objects or real objects which the child imagines to be other than what they are. This play is spontaneous but temporary, and as a rule has little continuity from day to day except in general form.

Imaginative play with objects takes chiefly the three following forms:

a. Animates object. Child may believe that the piano is going to bite him, or may animate food and play with rather than eat it.

b. Child has an imaginary object. One child, who had an imaginary key, at 33 to 36 months brought it to school with him every day clutched in his fist.

c. Personalizes object. May feed, play with, or talk to object as though it were a person.

7. *Imaginative Play in General*

Imaginative play is a common phenomenon in the preschool years. Though no detailed investigation of such phenomena was included in the present study, a very brief survey of the main age trends in this behavior will be given for the sake of completeness.

2 years: Talks to, feeds, toilets, and puts to bed teddy bear or doll.

2½ years: All varieties of imaginative manipulation of actual or imagined objects: house, furniture, objects, people. Gives imaginary tea party, using real or imaginary dishes and usually imaginary food. Conducts long imaginary telephone conversations, using toy or imaginary telephone.

Makes pies and cakes of mud. May pretend to eat them. Pretends to pick up objects from pictures, or off the wall. Frequently in their imaginative play they use real toy objects, or use blocks, etc., and pretend they are something else. Carry on imaginative conversations, taking part of both speakers.

3-4 years: Pretend to be firemen, truck drivers, etc. Usually at this age they use real toy trucks and other implements. Imaginary house play. Use dolls and real objects and pretend to be mothers, babies, fathers, etc. Pretend coming to call, go through daily domestic routines, etc. Play rôles of others and some dressing up. May have real or imaginary guests. Pretend to tell time with an imaginary wrist-watch. May tell imaginative stories. Their own rôles involve imagination in that they are the mother, the hostess, etc.

4 years: At this expansive age, particularly, is there telling of long, imaginative stories about their own or their friends' activities. Dress up like adult, Indian, etc., and pretend to be these people as they play house, store, hospital, etc. Have whole families of (real) teddy-bears, dolls, etc. Creative composing of short poems.

5-6 years: Much playing house with great interest in the rôles of mother and baby. Beginning of playing school. Dramatic play as at 4 years, in which they dress up in costumes or parts of costumes and play varied rôles.

7 years ff: Play house, school, library, store, cops and robbers. All involving considerable imagination though practical realistic details may be involved.

8 years ff: Giving of plays which they make up themselves. Imaginary play, more individualized from child to child, still continues.

Creative composing activities which occur in some children from four years on, should also be mentioned. At the earliest ages this creation may take the form of prose or poetry recited or told by the child. Later, the child may dictate to an adult. Still later he may write it down himself. The developmental gradient for this kind of behavior has not been well worked out as yet. Although there are individual variations in quality and amount of output, there probably are ages at which it commonly occurs more than at others.

D. DISCUSSION

1. *The Gradient for Imagination*

All of these variations of imaginative behavior just described appear to be very closely related to each other and not sharply demarcated one from the other. Animating an object occurs, as a rule, at a somewhat younger age than does personalizing an object, but they do not appear to be basically different phenomena. Similarly, playing with an imaginary animal appears to be closely related to playing with an imaginary child. Playing the part of an animal is not a phenomenon completely unrelated to playing the rôle of another person.

The age and chiefly—as will be suggested below—the individuality of a child determines largely which one or ones of these various phenomena any particular child will exhibt.

Figure 1 presents a gradient which suggests the probable developmental order and relation of the outstanding imaginative phenomena. It gives four

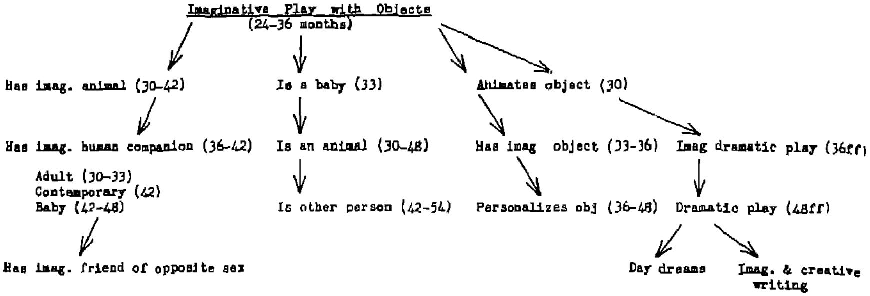

FIGURE 1
THE IMAGINATION GRADIENT

chief strands of development and indicates the stages along each strand. There is much overlapping, so that following any one strand a child may not have given up an earlier stage of behavior before exhibiting a later stage. Also any one child may exhibit phenomena from two or more lines of development simultaneously.

The four strands indicated on the diagram, all stemming from 2-3-year-old general imaginative play are:

a. Imaginary animals and playmates.
b. Impersonation of animals or persons.
c. Animating and personalizing objects.
d. Imaginative and dramatic play and creative writing.

To give a composite age summary, outstanding items are presented tabular-wise as follows in age order of their appearance (Table 2). Ages given are the ages when behavior is strongest.

TABLE 2
GRADIENT OF KINDS OF IMAGINATIVE BEHAVIOR

Imaginative play with objects (24-36 months)
Animates objects (30 months)
Plays rôle of a baby (33 months)
Plays with imaginary object (33-36 months)
Plays with imaginary animal (30-42 months)
Impersonates animal (30-48 months)
Has imaginary human companion (36-42 months)
Personalizes object (36-48+ months)
Impersonates another person (42-54 months)
Imaginary companion—not divulged to adult (5-10 years)

It will be noted that *has an animal playmate* generally precedes *impersonates an animal; has a human playmate* precedes *impersonates a human.* Furthermore, *has an animal* precedes *has a human playmate; is an animal* precedes *is another person.*

2. *Developmental Normality of These Phenomena*

The gradient just presented suggests the developmental normality of imaginary companions and related phenomena. We believe that any or all of the phenomena described in the gradient may occur, in sequence, as part of the natural development of the child, determined chiefly by internal factors, and occurring as part of the normal development of imaginative behavior. True, specific environmental factors such as absence of satisfactory human companions may call them forth at a somewhat early age or may cause their continuance past the normal time of disappearance, but this can be true of any developmental stage of any behavior. (Thus the "rocking on hands and knees" stage of prone progression (7) may be prolonged and intensified in institutionalized children who do not have other normal outlets, but it remains even in its exaggeration a normal stage.)

A confirmation of the fact that imaginative play behavior is proceeding according to normal laws of development is seen in the fact that not only does the child first play with imaginary animals, then with imaginary adults, and then with imaginary children, but that this same sequence appears in the dream life. Records of the dream life of the child suggest that normally he first dreams of animals, later of adults. and finally of other children. That the same sequence is followed in two such apparently unrelated fields, suggests that both are determined by underlying developmental factors and do not occur merely as the result of chance environmental stimuli.

We do not agree with such of the literature as suggests that imaginary playmates are dangerous or undesirable phenomena, to be discouraged by adults.

3. *Type of Child Who Exhibits Each of These Phenomena*

There has been much discussion in the literature as to the cause of imaginary playmates and related phenomena. Though environmental causes, such as loneliness and lack of companionship, dissatisfaction with ones own natural rôle or circumstance in life, undoubtedly play an important part, particularly as exciting causes, we believe that more basically the causes are these: (*a*) the natural appearance of a normal developmental phenomenon; and (*b*) the temperament of the individual child in question.

We find that not only are children who are highly intelligent, highly verbal, and of a generally "imaginative" nature, most likely to experience imaginary playmates and other related phenomena, but that the specific personality type of the child seems to determine which particular kind of imaginative phenomena he will experience. Thus the child who impersonates animals may be of a quite different type from the one who has imaginary human companions.

We shall describe the general personality types which we have observed to have imaginary animals, to impersonate animals, to animate or personalize objects, and to impersonate other people. The personality of children who have imaginary companions will be considered in more detail.

a. General personality type of children who have imaginary animals. It appears to be characteristic of children who have imaginary animals as playmates that they are children who have adjustment difficulties, particularly difficulties in social, i.e., inter-personal, adjustments. The animals seem to some extent to take the place of unsatisfactory or unacquired human friends. The following phrases descriptive of personality occur in the records of their cases:

> "Gets along badly with children"; "very fearful of new people"; "dependent on mother and aversion to children, slow to adjust to a group and plays quietly by herself"; "dictatorial, plays poorly with contemporaries"; "moody, negative, explosive, slightly dependent"; "a very dependent child, a lone wolf in school"; "negative, strong tendency to react by opposites, slow to adjust to new people."

b. General personality type of those who impersonate animals. This group of children appears to be highly imaginative, with high motor drive (though without high motor ability) very active and "into everything." They are often extremely destructive. May have rather low social behavior since they are often largely oblivious of other children. But they are often too much aware of themselves; and playing the rôle of an animal seems to afford them an indirect approach to themselves. They are emotionally dependent upon their mothers. Frequently they spend a good deal of time in some solitary concentrated activity that may become so excessive that it is followed by extreme fatigue.

c. Personality types of children who have imaginary companions other than animals. Though it appears that the personality type or temperament of any child is extremely influential in determining the kind of imaginary playmate, the variation here is almost as great as the number of individual children experiencing these phenomena. For this reason, rather than attempting to give a generalized summary, we shall present brief individual examples of the importance of the child's own personality in determining the type of imaginary companion. These are only selected examples, and the number could be multiplied. They are not intended as complete personality descriptions of the children, but are merely suggestive.

Girl JD, superior, first of two children. Has a boy companion named Bobby who may be big or little. He persisted from 36 to 54 months. *JD* is an independent, imaginative child. That her companion is of the opposite sex fits in with the fact that she is a dainty pretty little blonde child who is already interested in and attractive to boys. Another child, *BE*, also pretty and attractive to and attracted by boys in school, has a little boy companion only. He, too, varies in age.

Girl HL, very superior, only child. This little girl has imaginary animals, or men to whom she gives orders. She is an extremely high verbal, domineering child whose social behavior with contemporaries is poor. It is interesting that with poor social and little imagination she should choose older people, imitated from her father's workmen, with whom she does not have to carry on social relations but whom she merely orders around. Her one child companion appears very infrequently.

Girl BC, superior, second of two children. This girl is not an imaginative nor a high language child but is more given to gross motor activity. She is definitely lacking in ingenuity, and often complains that she has nothing to play with. One would scarcely expect her to create an imaginary companion and she does not do so, but (from 26 to 37 months) borrows outright her older sister's imaginary companion and plays with this.

Boy BT and Girl GJ, both superior, both older of two. Each of these children is highly social, very verbal, extremely imaginative. They make friends easily and get along well with both adults and children. Are not lacking for playmates. It is noteworthy that with their high social, both these children choose real people for their imaginary playmates. That is, they pretend that real (but absent) people are with them, playing with them, etc. Thus their companions are their teacher at school, preferred girl and boy playmates, a cousin.

Boy MK, superior, older of two. This child is one of our most highly imaginative children, verbally and in his play. In nursery school he often would pick imaginary objects off the wall, rescue imaginary kittens out of imaginary trees. Though his social adjustment was not poor, he was as likely to play alone as with others because he could entertain himself quite adequately with his imagination. It is typical of him that he has the most highly imaginative companions of any one of the cases. These companions have extremely imaginative names such as: Tulipka, Bisslebamboo. They have no special form or shape though they seem to be more or less human, and though he even sometimes brings them to school, he does not talk about them to others unless specifically asked to.

Contrasting is the imaginary playmate of *Girl IT, very superior, an only child.* *IT* is somatotonic, active, realistic, matter of fact. Though she has a good imagination, she does not lose sight of firm reality. Her imaginary companion is an earthy, somatotonic, active gentleman named Mr. Carlson, who is always busy, and with whom

> she carries on active, realistic social relations, phoning him when he is away from her. *IT* is of Swedish parentage, and Mr. Carlson also is Swedish. Another of the Swedish children in our group, *Girl SB*, also has a Swedish companion, a girl called Karen. Neither child actually knew anyone by these names. Mr. Carlson frequently changed age and individuality. Sometimes he was old, sometimes young. At one time he was *IT*'s father, later her uncle, her husband, her baby. But he was always masculine. *IT* has always shown a strong preference for masculine companionship.

d. Type who animate or personalize objects. There are not enough of these children (in our group) to warrant elaborate generalizations. As a rule, however, if this behavior occurs extensively, it—like play with imaginary animals or personification of animals—suggests difficulty in, lack of satisfaction from, or lack of interest in more usual social relationships, combined with some degree of imagination.

e. General personality type of those who impersonate other people. Nearly all of these are highly imaginative children. Unlike those who take the part of animals, these children are apt to have high social abilities and to get on well with other children. In fact it may be a part of their high social that they so easily identify themselves with others. The change of personality appears by no means to be associated with poor general or social adjustment. These children often indulge in elaborate imaginary play, as well. They are usually very good at entertaining themselves.

f. Type of child who customarily does not have imaginary playmates and related phenomena. There are many children of a personality makeup such that one could almost predict that they would not experience imaginary playmates. These are children of a stolid, matter-of-fact, literal temperament, who take everything at its face value and do not, from earliest childhood, show a sign of imagination. These are children who may be hard to entertain and who have much trouble in keeping themselves entertained. Since they do not use imagination in play, their toys soon bore them and they cannot devise other out of household odds and ends or (as some can) out of nothing at all.

Destructive, mechanically minded, somatotonic (20) boys with high gross motor behavior and low language are particularly unlikely to have imaginary companions. Also twins, especially identical twins, as a rule do not have them. The close companionship which they usually furnish each other seems to make this unnecessary.

This discussion of the different types of children who customarily experience the different kinds of imaginative phenomena is of necessity suggestive rather than definitive. Not enough is actually known at this time about the different personality types to allow a definitive presentation.

As the description of different types within the imaginary human companion domain suggests, there is considerable variation even among children experiencing any one type of imaginative phenomenon. Furthermore these groupings are elastic and by no means mutually exclusive since, as we have already noted, one child frequently exhibits several or all of the different phenomena.

E. SUMMARY

This paper presents data with regard to imaginary companions and other imaginative phenomena observed in 210 children of nursery school age who attended the Guidance Nursery at the Yale Clinic of Child Development or who were examined as part of the guidance service.

Forty-five of these children (21 per cent) were found to exhibit such phenomena.

Imaginative phenomena were observed to fall into several chief classifications, which may be arranged in the following age order, as to age when they are strongest:

Imaginative play with objects (24-36 months).
Animates objects (30 months).
Plays rôle of a baby (33 months).
Plays with imaginary object (33-36) months).
Plays with imaginary animal (30-42 months).
Impersonates animal (30-48 months).
Has imaginary human companion (36-42 months).
Personalizes object (36-48+ months).
Impersonates another person (42-54 months).
Imaginary companion—not divulged to adult (5-10 years).

A suggestive gradient is presented which indicates the several threads or general kinds of imaginative behavior which go to make up the total "imagination gradient." These threads are:

1. Possessing an imaginary animal, or human, companion, or "boy or girl" friend.
2. Playing the rôle of a baby, an animal, a person.
3. Imaginative play with some specific object (animates object, has a specific imaginary object, personalizes object).
4. The various types of imaginative dramatic play, and creative story telling and writing, and composing poems and songs.

Thus the imaginary companion frequently discussed in the literature as a somewhat unique phenomenon, is here considered as merely one part of a total "imagination gradient," any or all parts of which may quite normally occur in any one child.

Detailed information as to age, sex, family status, etc., of children experiencing these phenomena is given, as well as information about age, sex, source, characteristics, and purpose of imaginary phenomena. Comparison of present findings with those in the literature suggests that in the few instances where major discrepancies occur they result chiefly from the fact that earlier studies tend to generalize one part of the gradient as though it were the whole gradient.

In the literature the suggestion appears that children of a certain temperament, i.e., children who are lonely, timid, imaginative, or "subject to personality difficulties" are most likely to have imaginary companions. We do not find that there is one general type which experiences all these phenomena —rather that although the personality of the child largely determines whether or not he will exhibit imaginary phenomena, each of the various kinds of imagination appears in its own particular personality type. There is also a kind of personality which does not customarily experience these phenomena. We definitely do not find imaginary companions only in timid or lonely children or in those exhibiting personality difficulties.

The present study suggests that the appearance of imaginary companions and related phenomena occurs in many, though not in all, children, as a natural developmental phenomenon, characteristic of the age period from 2½ to 4½ years, and perhaps persisting secretly considerably past that age.

In our group of cases, friends and relatives of the children often consider their imaginative behavior to be harmful. Parents are likely to limit their dislike and disapproval to those instances in which the child plays with or plays the rôle of imaginary animals.

REFERENCES

1. BAKWIN, R. M., & BAKWIN, H. Psychologic Care During Infancy and Childhood. New York: D. Appleton-Century, 1942. Pp. xv+317.
2. BENDER, L., & VOGEL, B. F. Imaginary companions of children. *Amer. J. Orthopsychiat.*, 1941, **11**, 56-65.
3. BRECKENRIDGE, M. E., & VINCENT, E. L. Child Development: Physical and Psychological Growth Through the School Years. Philadelphia: Saunders, 1943. Pp. ix+592.
4. BRITTAIN, H. L. A study in imagination. *Ped. Sem.*, 1907, **14**, 137-206.
5. BURNHAM, W. H. The observation of children at the Worcester Normal School. *Ped. Sem.*, 1891, **1**, 219-224.
6. ———. Individual differences in the imagination of children. *Ped. Sem.*, 1892, **2**, 204-225.

7. GESELL, A., & AMES, L. B. The ontogenetic organization of prone behavior in human infancy. *J. Genet. Psychol.*, 1940, **56**, 247-263.

8. GESELL, A., & ILG, F. L. (In collaboration with Learned, J., & Ames, L. B.) Infant and Child in the Culture of Today: The guidance of development in home and nursery school. New York: Harper, 1943. Pp. xii+399.

9. GREEN, G. H. Psychoanalysis in the Classroom. New York: Putnam, 1922.

10. HARRIMAN, P. L. Some imaginary companions of older subjects. *Amer. J. Orthopsychiat.*, 1937, **7**, 368.

11. HARVEY, N. A. Imaginary playmates and other mental phenomena in children. Ypsilanti, Michigan: State Normal College, 1918. Pp. 124.

12. VON HUG-HELLMUTH, H. Study of the Mental Life of the Child. (Trans. by James T. Putnam and Mabel Stevens). Monograph 29. Washington, D. C. Nervous and Mental Disease Publishing Co., 1919.

13. HURLOCK, E. B., & BURNSTEIN, M. The imaginary playmate: a questionnaire study. *J. Genet. Psychol.*, 1932, **41**, 380-392.

14. JERSILD, A. T. Child Psychology. New York: Prentice Hall, 1940. Pp. 389.

15. JERSILD, A. T., MARKEY, F. V., & JERSILD, C. L. Children's Fears, Dreams, Wishes. New York: Teachers College, Columbia University, 1933.

16. KIRKPATRICK, E. A. Fundamentals of Child Study. New York: Macmillan, 1929. Pp. xix+380.

17. KLÜVER, H. The eidetic child. In *Handbook of Child Psychology.* (Ed. Murchison). Worcester, Mass.: Clark Univ. Press, 1931.

18. MUNROE, J. P. Report at the Chicago Meeting of the Nat'l. Education Association in July, 1893. *Ped. Sem.*, 1894, **3**, 182-184.

19. NICE, M. M. A child's imagination. *Ped. Sem.*, 1919, **26**, 173-201.

20. SHELDON, W. H. The Varieties of Temperament. New York: Harper, 1942. Pp. x+520.

21. SVENDSON, M. Children's imaginary companions. *Arch. Neurol. & Psychiat.*, 1934, **32**, 985-999.

22. SWETT, H. P. Her little girl. *Ped. Sem.*, 1910, **17**, 104-110.

23. TANNER, A. E. The Child: His Thinking, Feeling and Doing. Chicago: Rand McNally, 1915. Pp. 534.

24. VOSTROVSKY, C. A study of imaginary companions. *Education*, 1895, **15**, 383.

25. WICKES, F. G. The Inner World of Childhood: A Study in Analytical Psychology. New York: D. Appleton, 1927.

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PSYCHOLOGICAL SURVEY ON A CHILD POPULATION IN WILLIAMSON COUNTY, TENNESSEE*[1]

Williamson County Child Guidance Study, Franklin, Tennessee

WILLIAM F. ROTH, JR., M.D., FRANK H. LUTON, M.D., AND VIRGINIA KIRK

One phase of the research program of the Williamson County Child Guidance Study was a survey of mental health conditions in the county. This project was a preliminary step in an effort to demonstrate the use of existing public health agencies in the promotion of better mental health in rural areas. A description of the county and an account of the general plan of research, the results of the psychiatric survey, and the mental health program evolved have been given in other communications (1, 2, 3).

Early in the course of the research program it became apparent that a county-wide psychological survey would be necessary or at least very valuable. About one-half of the school children who were referred by the teachers as presenting mental health problems fell into the diagnostic category of "question of mental retardation." Accurate appraisal of these cases called for psychological test data. Also there was always the possibility that at some future time a child would be referred for study. The need for this was borne out by the fact that in the period from 1935 to 1942, 7 per cent of the general population were referred on account of some mental health problem. In the "intensive survey" approximately one-seventh of the population of the county were included in a sample which called for the study of every individual living in certain prescribed areas. Some record of the intellectual capacities of these individuals was considered desirable. The extension of the psychological survey to all school children in the county would provide a basis for becoming acquainted with all children and their families without arousing the fears and antagonisms which might be expected to arise in the community if the idea prevailed that only the abnormal and pathological were being sought out for study.

In addition to these practical considerations it was also felt that such a survey might throw light on problems associated with the psychological test-

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[1] A project of the Tennessee Department of Public Health, financed by the International Health Division of the Rockefeller Foundation. (Established in Sept. 1935, closed in Sept. 1942).

ing of rural children. For instance, the interpretation of tests for a rural population depends in part upon the adequacy of the sampling methods used in the development of norms. It is notoriously difficult to obtain an unselected sample of the population, especially the intellectually lowest segment, that is, idiots and imbeciles.

A similar survey was made on the child population of Bath, England, by Roberts, Norman, and Griffiths (4). This study was of significance because it was so complete. Actually 98.9 per cent of the children in the Bath survey were tested (5). The prospect of being able to provide a rural counterpart of that survey was a most inviting one.

PLAN OF STUDY

Since there were over 4,000 children to be tested within a limited period of time, group tests were used. The Kuhlmann-Anderson Intelligence Tests, the Pintner-Cunningham Primary Mental Test, and the Revised Beta Examination were selected because of their lack of emphasis on language usage.[2] Each child was given a combination of the Kuhlmann-Anderson test and one of the other tests, according to the child's grade placement,—the Pintner-Cunningham for children in the first and second grades, and the Beta for children above the second grade. The two tests were given on the same day (the Kuhlmann-Anderson first), or as close together as possible.

A retest of all children was done after an interval of from four to six months.

The first administration of the tests was planned for the late summer and early fall of 1936 shortly after the beginning of the school year, with the second testing to fall in the second semester early in 1937.

There were 90 schools in the county, 66 of them for white children and 24 for colored. They were fairly evenly distributed over the 586 square-mile area, the county being approximately 30 miles long and 20 miles wide (see map, Figure 1). The four schools in the town of Franklin, the county seat, included a private preparatory school, public elementary and high schools for the white children, and a combined elementary and high school for colored children, this being the only high school for colored children in the county. Of the 86 rural schools 54 were one-room and 24 were two-room schools; eight were relatively large white schools at small rural trading centers where high schools were maintained. The total enrollments of three

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[2] According to the Federal Census, 7 per cent of the inhabitants of the county 10 years of age and over in 1930 were illiterate i.e., admitted they could not read and write their own names.

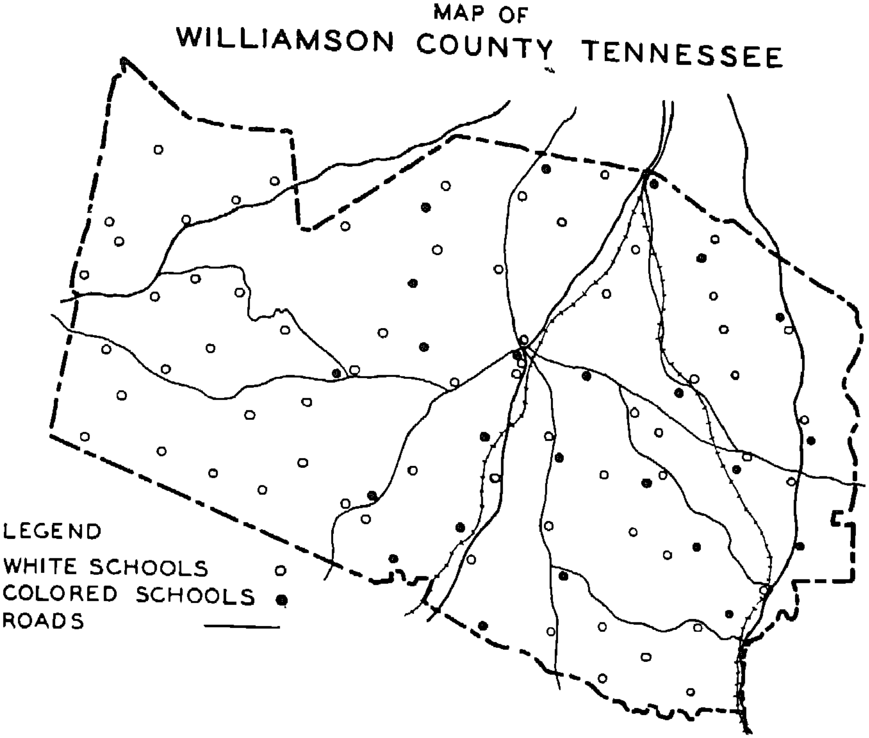

FIGURE 1
MAP OF WILLIAMSON COUNTY, TENNESSEE, SHOWING MAIN ROADS AND THE LOCATION OF THE 90 SCHOOLS (1936-37)

of these averaged about 100 pupils. No public transportation of pupils was provided. For a short description of the geography of the county, see Paper No. 1.

Plans were made for obtaining the necessary data for certain projected collateral studies. Inasmuch as there was some prospect of being able to continue observation of the population over a long time, it seemed desirable to lay the foundations for a study in our community along lines suggested by Campbell's survey (6) of an urban community and its follow-up by Fairbank (7). Then, there was the question of the relationship between intelligence and mobility in the geographic sense, since mobility within a limited radius is a striking characteristic of the farm tenant population in this county. Russell's survey (8) is an example of this type of study.

We were also interested in studying the relationship of the problems of children to their order of birth, school attendance and type of school attended to performance on intelligence tests, and mental ability with education, occupation, and economic status of the parents.[3]

It was planned to obtain information on these various topics by visiting the parents of the children in their homes. A form to be filled out for each family represented in the group of children tested was prepared. It was possible to obtain this for a 20 per cent sample.

Finally, in order to obtain subjective data on ambitions and emotional attitudes a simple questionnaire was presented to all children in and above the third grade.

DEFINITION OF THE SAMPLE

The fraction of the child population to be tested was defined as follows: All children born from September 2, 1922, to September 1, 1930 (inclusive), who were bona fide residents of Williamson County on May 31, 1937. Thus, the children to be tested would be those who had reached or passed the age of six years, but had not yet reached the age of 14 years on September 1, 1936, and who were resident in the county on March 31, 1937. This date was termed the "census date."

The criterion for residence was that the child, regardless of where he attended school, must have his regularly established home with parents or guardians within the limits of the county. When children were in institutions, at boarding schools, or on visits to friends or relatives, the question of residence was decided on the basis of the location of the permanent home of the parents or relatives to whom the child would be discharged or returned at the termination of his stay at the institution or temporary home.

At the time the survey was started it was estimated, on the basis of school enrollment figures and the 1930 census, that the population sample to be tested contained between 4,000 and 4,500 children. Subsequently, since the age group figures of the 1940 census have become available, it has been possible to calculate, by interpolation (assuming a constant increase in population), the number expected to be present May 31, 1937, on the basis of census statistics. This number is 4,333.

Williamson County has a population of approximately 25,000, three-fourths of which are white and one-fourth colored. At least 75 per cent of the children to be tested were living on farms and 42 per cent were children of tenant farmers. In the absence of any public transportation of pupils, most of them walked at least a mile to school through fields or over rugged wooded hills. About one-fifth of them were living in the sparsely populated western third of the county where the scrub oak forests and rocky hillsides afforded bare subsistence for a relatively isolated group of people. The more gregarious Negroes were usually to be found in the Central Basin area either concentrated around the centers of population or clustered in a few rural localities, usually on less desirable land. The colored children gave an impression of intellectual and cultural poverty. Social training and discipline in general were lacking. The majority of the white population was living in the Central Basin on a range of social and cultural levels that varied from the highest, in prosperous town or farm homes, to the lowest, in the huts and shanties of civilization's backwash, the so-called rural slums.

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[3] See reports from the Bath Study (9) and (10) for similar studies.

PSYCHOLOGICAL SURVEY PROCEDURE

The county was mapped according to school communities. The general pattern of procedure in any given school and its surrounding territory was as follows:

(1). A worker visited the school, explained the survey to the teacher and made out a preliminary list of the children in that area with ages and grade placements. In some instances, where the teacher resided in the neighborhood of her school, she was well acquainted with the families in the community and could help the worker get acquainted with the children.

(2). The worker returned to the school on the appointed date at the beginning of the morning school session. On the way she would often stop for children who might not otherwise have gone to school. This also aided in establishing friendly relations with the children before testing.

The Kuhlmann-Anderson test was given first and the Pintner-Cunningham and Beta tests after the recess period. Time was saved by "staggering" the Kuhlmann-Anderson tests, i.e., running through the entire series of 39 tests but a single time, the children coming into the room when it was time to give the tests appropriate to their respective grade placements.

A "log" or protocol of the testing was kept for each school. The exact routines of testing, together with notes on any unusual circumstances, general behavior of the children, and other details of interest were recorded. The administration of the tests was standardized by having the workers give the tests in the presence of each other, with subsequent mutual criticism.

(3). It usually required several return visits to each school to test children who had previously been absent. This often required elaborate preparation (visiting in homes, explanations to parents, arrangements for transportation, etc.), and the execution of this part of the program presented problems in logistics that tested the ingenuity of the tester. In order not to disrupt the routine of an entire school for the sake of testing a small group, various other accommodations were used. Tables set up in the school yard, nearby church buildings, and even the school woodshed sometimes proved a convenient site for testing. In instances where the children could not be gathered at or near a school, they were tested individually or in small neighborhood groups at a home, usually in the yard or on the front porch. When children were tested individually or in groups of six or less, notations to that effect were made on the test booklets so that, if desired, these tests could be considered separately. This took as much time as the more formal testing. In short, our difficulties in conducting this rural survey were similar to those described by Anderson (11).

(4). After the testing program was well under way, clerical personnel verified birthdates through official records and scored tests under supervision. All tests were scored twice, the checking being done as a separate operation by different teams. After the first tests had been scored, the children's mental ages based on the *K-A* were then used as basis for grade placement in the second administration of all tests. For example, children in the third grade or above with indicated mental ages of appreciably less than eight years were scheduled to receive the Pintner-Cunningham test rather than the Beta.

(5). The testing was repeated at all schools during the second semester of the school year, keeping the interval between first and second tests as uniform as possible. The same general procedure was repeated, with the addition of the attitudes and ambitions questionnaire. The Goodenough Intelligence Test was given to some children who appeared too low intellectually for the use of the other tests. In some cases of idiocy or low-grade imbecility the workers' observations had to suffice for purposes of tentative classification.

(6). Analysis of the test results was made by Alphonse Chapanis (12).

VERIFICATION OF BIRTHDATES

In order to check on the accuracy of children's birthdate information, a trial series of over 200 birthdates from school registers were selected at random, and were checked against birth certificate records. About 70 per cent of these could be checked against official records; 10 per cent of the records so checked were inaccurate. We, therefore, decided to check all birthdates against the official records of birth certificates and where such records were not available to seek other records made at or near the time of birth. Table 1 shows the type of verification, and the results of this work. Out of a total of 4.014 children of the sample that were tested by group tests, there were 3,711 or 92.5 per cent for whom birthdates were regarded as satisfactorily verified. This included three categories: (*a*)[4] Those whose birth certificates were obtained, either in the State of Tennessee or from the vital statistics agencies in other states and territories. (*b*) Other valid written records defined arbitrarily as a written record made at the time of birth, such as the family Bible or Health Department records made within three years of the supposed date of birth. (*c*) When neither of the above types of records could be found a date was regarded as reasonably accurate if the verbal statement of the parent agreed with other records available, for example, the record on the school register and health examinations. (*d*) In 7.5 per cent of cases we had either one unconfirmed statement or several dates given at different times which did not agree. In these cases an arbitrary choice was made or the one unconfirmed statement accepted.

TABLE 1

MEANS OF VERIFICATION OF BIRTHDATES OF 4,014 CHILDREN OF THE POPULATION SAMPLE THAT WERE TESTED BY GROUP TESTS

Type of verification	Number of cases	Per cent
Total	4,014	100.0
(*a*) Birth certificate	3,054	76.1
(*b*) Other valid written record	309	7.7
(*c*) Verbal statements in agreement	348	8.7
(*d*) Arbitrary choice or one unconfirmed statement	303	7.5

COMPLETENESS OF TESTING

As has been related, the ascertainment of the sample and the administration of tests proceeded simultaneously rather than consecutively. This was because of the difficulty in knowing which children belonged in our population sample. We had to make our own registers of children from individual school records and by checking at homes; no child could be counted definitely as one of the sample until the census date; time was required for verification of birthdates near the upper and lower age limits. More than 450 children who had been tested eventually fell outside of the sample.

During the period of the first testing, every effort was made to find and test children who were not in attendance at the Williamson County schools.

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[4] Throughout this discussion the type of birth certificate referred to is that filed by a physician or midwife shortly after delivery of the infant. Recently a great many "delayed" certificates have been filed. In respect to validity of date of birth these "delayed" certificates are more nearly comparable to our second category.

The periphery of the county had to be mapped and every home visited in order to make sure that no children had been overlooked. Many Williamson County children were going to schools in the adjacent counties. Testing in 10 out-of-county schools and two orphanages was carried out in accordance with our general testing routines. In spite of all the efforts made to reach children in isolated, hidden homes, when the survey was discontinued there were 125 children known to belong to the sample whom, for one reason or another, we had not tested.[5]

In addition to these, there were 39 for whom resident status on the census date was uncertain, and there were 26 cases where we were unable to establish age exactly. Although some of these children might have fallen outside our sample, there were undoubtedly some who escaped enumeration altogether, so that for the sake of conservatism in calculating the completeness of the survey, these 65 children were considered as belonging in the population sample.

The final figures on the completeness of the testing are given in Table 2, from which it will be seen that there were 4,247 children included in the population sample, of which 4,014 or 94.5 per cent were tested by group tests, while intelligence was assessed by other methods in 43 cases or 1.0 per cent of the total. Thus, we arrived at an evaluation of intelligence in 95.5 per cent of the cases and failed to obtain data on 4.5 per cent.

TABLE 2*

COMPLETENESS OF TESTING OF 4,247 CHILDREN IN THE SELECTED POPULATION SAMPLE

	Number of cases	Per cent
Total number of children	4,247	100.0
Tested by group tests	4,014	94.5
Intelligence otherwise evaluated	43	1.0
Intelligence not tested or otherwise evaluated	190	4.5

*Simply evaded testing—125; missed through failure to establish residence—39; missed through failure to establish age—26; totaling 190.

The breakdown by sex and color, given in Table 3, shows that the completeness of testing was much better for the white than for the colored children, and was better for the girls than for the boys.

In Table 4, we show the means by which intellectual capacity was assessed in the 4,057 cases comprising the 95.5 per cent in which intelligence was evaluated.

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[5] Other causes of failure to test were: removal from the county, lack of understanding on the part of the parents, severe illness or death.

TABLE 3

NUMBER AND PERCENTAGE OF CHILDREN IN SAMPLE WHOSE INTELLIGENCE WAS EVALUATED, BY SEX AND COLOR

	Children in sample as ascertained	Cases in which intelligence was evaluated	
	Number	Number	Per cent
Total	4,247	4,057	95.5
White male	1,792	1,720	96.0
White female	1,602	1,557	97.2
Colored male	434	386	88.9
Colored female	419	394	94.0

TABLE 4*

MEANS OF EVALUATION OF THE INTELLIGENCE OF 4,057 WILLIAMSON COUNTY CHILDREN INCLUDED IN THE POPULATION SAMPLE

Means of evaluation of intelligence	Number of cases
Total	4,057
K-A Tests and Revised Beta Examination	2,337
K-A Tests and Pintner-Cunningham Primary Test	1,530
K-A, Revised Beta Examination, and Pintner-Cunningham Primary Test	118
K-A Tests only	15
Pintner-Cunningham Primary Tests only	11
Revised Beta Examination only	3
Goodenough Intelligence Test only	38
Observation of Behavior only	5

*This table does not take into account the number of times each child took the tests indicated. In most cases twice, in some cases only once.

COMMENT

When we review the results and compare the accomplishments with the original objectives of the program we find that moderate success was achieved in the task of testing a population spread over a large rural area. We regret that we failed to accomplish the complete testing of all the children.

The loss in the testing of 4.5 per cent of the selected population sample is a serious defect in the survey. By the very nature of the circumstances that caused most of these children to be missed, they must have constituted a selected group.

SUMMARY

1. A general account is given of a psychological survey which comprised one phase of the research program of the Williamson County (Tenn.) Child Guidance Study. Two prime objectives of the survey were the appraisal, by group tests, of the intelligence of the county's child population (ages 6-13) and the collection of data for certain socio-psychological studies.

2. The population sample to be tested, as arbitrarily defined, included all children born from September 2, 1922, to September 1, 1930 (inclusive), who were residents of Williamson County on May 31, 1937. The number of children ultimately considered as meeting these criteria was 4,247.

3. The Kuhlmann-Anderson Intelligence Tests and the Pintner-Cunningham Primary Mental Test were administered to children in the first and second grades, while the Kuhlmann-Anderson and the Revised Beta Examination were given to all children in the third grade and above. A second administration of the tests was effected routinely after an interval of from four to six months. In the case of a few children whose intelligence was too low for measurement by these tests, an estimate was made on the basis of the Goodenough Intelligence Test or observations of behavior.

4. Birthdates were satisfactorily verified for 92.5 per cent of the children in the sample.

5. Of the total of 4,247 children included in the sample, 94.5 per cent were tested by one or more group tests. Some appraisal of intelligence was made for a total of 4,057 or 95.5 per cent.

Acknowledgments

To our colleagues, Helen F. Gildea and Winifred Zwemer, field workers of the Child Guidance Study at the time of the psychological survey—who shared with us the arduous labors of the testing, we express appreciation and recognition of a job well done.

Finally, we wish to acknowledge the contributions to the survey afforded by the patient endeavors of the clerical workers of our staff, the assistance rendered by personnel of other divisions of the State and County Health Departments, and the friendly forbearance and positive coöperation of the Williamson County School Board and the individual teachers.

References

1. Anderson, R. G. Methods and results of mental surveys. *J. Appl. Psychol.*, 1922, **6**, 1-28.
2. Campbell, C. M. The subnormal child—a survey of the school population in the Locust Point district of Baltimore. *Ment. Hyg.*, 1917, **1**, 96-147.
3. Chapanis, A., & Williams, W. C. Results of a mental survey with Kuhlmann-Anderson Intelligence Tests in Williamson County, Tennessee. *J. Genet. Psychol*, 1945, **67**, 27-55.
4. Fairbanks, R. E. The subnormal child—seventeen years after. *Ment. Hyg.*, 1933, **17**, 177-208.
5. Roberts, J. A. F., Norman, R. M., & Griffiths, R. Studies on a child population: I. Definition of the sample, method of ascertainment, and analysis of the results of a group intelligence test. *Ann. Eugen., Lond.*, 1935, **6**, 319-338.

6. ———. Studies on a child population: III. Intelligence and family size. *Ann. Eugen., Lond.,* 1938, **8**, 178-215.

7. ROBERTS, J. A. F. Observations on a representative group of children of school age, with an account of some family and social characteristics of the brightest, the average and the dullest. *Proc. Amer. Assn. Ment. Defic.,* 1939, **44**, 79-89.

8. ———. Studies on a child population: V. The resemblance in intelligence between sibs. *Ann. Eugen., Lond.,* 1940, **10**, 293-312.

9. ROTH, W. F., JR., WILLIAMS, W. C., & LUTON, F. H. Relationship of mental hygiene to a local health department program. *Amer. J. Publ. Health,* 1942, **32**, 1005-1012.

10. ROTH, W. F., JR., & LUTON, F. H. Initial experiences with a psychiatric clinic in a rural health center. *Amer. J. Orthopsychiat.,* 1943, **13**, 290-297.

11. ———. The mental health program in Tennessee: I. Description of the original study program; II: Statistical report of a psychiatric survey in a rural county. *Amer. J. Psychiat.,* 1943, **99**, 662-675.

12. RUSSELL, J. B. The measurement of intelligence in a rural area. *Brit. J. Psychol.,* 1930, **20**, 274-295.

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THE LANGUAGE DEVELOPMENT OF A GROUP OF TRIPLETS*

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A. Language Development of Infant Triplets

The language development of a group of triplets was studied by the writer as part of a larger developmental study of triplets.[1] Data on time of appearance of developmental traits were obtained from questionnaires answered by parents and other relatives. Comparison of the triplets with groups of unselected singletons in respect to the appearance of such traits as sitting and walking alone showed the triplets to be from one to three months slower than the singletons.

The questionnaire included questions on the age at which each triplet spoke his first word and the age at which he talked in sentences. Table 1 gives the findings for these questions.

TABLE 1
Ages of the Beginning of Speech in the Triplet Group

Trait	*N*	Age in months range	Median	Mean	*SD*
Say first word	82	8-36	16.00	16.90	5.25
Talk in sentences	81	11-84	20.08	20.65	8.25

Shirley (8) gives 15 months as the median age for saying the first word and 25.1 months for saying the first sentence. Mead (5, 6) says that the mean age for normal children to begin talking is 15.32 months and for feeble-minded children, 38.52 months. Gesell (2) says that at 12 months a child should be able to say two words besides "Mama" and "Dada"; at 18 months, he should say five or more words. The triplets were about a year slower in saying the first word than normal single-born children in these groups. Apparent acceleration for first talking in sentences may not be real when allowance is made for lack of uniformity in interpreting the young child's speech.

Observation of twins has shown that often their comprehensible speech is retarded because of a jargon which for want of a better term called secret

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[1] Howard, R. W. A Developmental Study of Triplets. Ph.D. Thesis on file in the University of Minnesota Library, 1934.

language is used by the two children only and understood by no one else. The parents of the triplets were asked whether they observed this jargon. Of the 49 parents who replied, 57 per cent stated that the secret language had not been observed, 42 per cent that it had. The age at which it ended for nine triplets ranged from 12 to 84 months. For the most part, the age at which the secret language began was comparable to the age at which other children begin to talk. These answers, like all the data in this study obtained from questionnaires, are open to criticism because of the inaccuracies inherent in the questionnaire method.

B. LANGUAGE DEVELOPMENT OF PRESCHOOL TRIPLETS

Language development at the preschool level was studied by means of several tests—the Minnesota Preschool (3), the Van Alstyne Picture Vocabulary (14), the McCarthy Language (4), and the Merrill-Palmer (13). The Merrill-Palmer and the Minnesota Preschool include both language and non-language tests, though the Merrill-Palmer contains no provision for scoring the two types separately. A rough comparison of performance on language and non-language tests in the Merrill-Palmer showed, however that the triplets tended to do better on the non-language tests. Scores on the Minnesota Preschool (Table 2) show a consistent superiority for the non-verbal *IQ*'s in this small group. The boys have higher verbal *IQ*'s than the girls—a finding not in accord with the usual sex differences in early language development. On the Merrill-Palmer test the average *IQ* of the 18 children tested was 89.4 and the standard deviation 16.75.

TABLE 2
IQ's EARNED BY TRIPLETS ON MINNESOTA PRESCHOOL TEST

Group	*N*	Composite *IQ*	Composite *SD*	Verbal *IQ*	Verbal *SD*	Non-verbal *IQ*	Non-verbal *SD*
Total	18	87.80	16.2	82.3	14.4	92.3	2.9
Boys	8	91.25	16.5	85.0	19.0	95.0	7.0
Girls	10	85.00	15.4	80.0	13.6	90.0	15.0

Three sets of triplets were given the Van Alstyne test. Mental ages earned on this test were similar to those found on the Minnesota Preschool test.

Six sets of triplets took the McCarthy language test. This test measures language development in a controlled play situation. A standardized series of toys is presented to the child and the experimenter records verbatim the first 50 responses made by the child while he is engaged with the toys. The 50 responses made by each child in this group were analyzed according to the

McCarthy method and the results compared with data given for singletons by McCarthy and for twins by Day.

The mean length of time required to obtain 50 responses from the three-year-old triplets was 7.6 minutes; the four-year-old triplets, 13.1 minutes; and the five-year-old triplets, 10 minutes. There was no consistent sex difference. The length of these interviews was from five to 10 minutes shorter than reported by McCarthy for the same ages.

Smith (9), Nice (7), McCarthy (4), and Day (1) found that the number of words used in each response was correlated with mental and chronological age and was the best single measure of language development. Table 3 which gives the mean length of response for the singleton, twin, and triplet groups shows that the triplets are in general retarded behind the other groups, but that their retardation behind the singletons is more consistent and pronounced than behind the twins. Comparison cannot be made with the five-year-old singletons because McCarthy does not report data for that age.

TABLE 3
THE MEAN LENGTH OF RESPONSE FOR SINGLETON, TWIN AND TRIPLET GROUPS

Group	Mean length of response (in words) 3-year-olds	4-year-olds	5-year-olds
Singleton	3.40	4.30	—
Twin	2.50	3.00	3.10
Triplet	2.78	2.04	2.98

Day used the length of response for calculating a language age and language quotient with meanings comparable to mental age and intelligence quotient. The mean language quotient for the 18 triplets was 56.1 and the standard deviation 18.2. The mean language quotient for the eight boys was 62.25 and for the 10 girls, 50.5. The language quotient was consistently low for all the triplets, the range being from 25 to 95.

The responses also were subjected to analysis on the basis of sentence structure and function according to the method worked out by McCarthy (4) on singletons and used later by Day (1) in her study of twins. McCarthy's methods of analysis were adapted from Piaget's (8) earlier study. McCarthy defines constructional analysis as "analysis according to construction of responses which attempts to indicate stage of grammatical complexity that the child has reached or in other words how closely his sentence structure approximates adult conversation, his able criterion upon which to model his speech."

Functional analysis means the analysis of the response according to its relation to the child's environment. Piaget's functional classifications included egocentric speech where the child disregards his audience, speaking only about himself and making "no attempt to place himself at the point of view of his hearer"; and socialized speech where the child's remarks are directed to or for the benefit of his hearer.

Findings for constructional and functional analysis were compared with the data for the twin and singleton groups. Although the percentages for constructions showing growth in language are much smaller than those given by McCarthy, the figures for the five-year-old triplets approach the developmental trend for the singletons. Structurally incomplete responses are fewer at this age; simple, complex, and elaborated sentences increase. Although the analysis was based on the comprehensible responses only, it was found that incomprehensible responses decreased. At three years, 8 per cent of the total number of responses were incomprehensible; at four years, 30 per cent; and at five years, 1 per cent. Among the three-year-old triplets, 25 per cent of the responses were semi-comprehensible; among the four-year-olds, 13 per cent; and among the five-year-olds, 5 per cent.

The results of the functional analysis of the triplets' responses—also based on comprehensible responses only—as compared with singletons and triplets are shown in Table 4. As among McCarthy's singletons, adapted informa-

TABLE 4
FUNCTIONAL ANALYSIS OF McCARTHY LANGUAGE TEST FOR SINGLETON, TWIN, AND TRIPLET GROUPS

Function	Percentage of total responses							
	Three-year-olds			Four-year-olds			Five-year-olds	
	Singletons	Twins	Triplets	Singletons	Twins	Triplets	Twins	Triplets
Egocentric responses	4.0	1.0	15.0	1.3	1.0	17.0	2.0	1.00
Naming	19.0	22.0	25.0	11.0	19.0	26.0	22.0	39.00
Remarks about immediate situations	21.0	27.0	14.0	20.5	29.0	27.0	24.0	26.00
Remarks associated with situations	11.0	1.0	5.0	11.2	1.5	0	1.5	6.00
Irrelevant remarks	1.5	1.0	2.0	2.0	0	0	1.0	.04
Criticism	1.0	.9	0	1.1	1.1	0	1.1	.09
Emotionally toned responses	9.0	18.0	32.0	7.0	14.0	17.0	13.5	12.00
Questions	13.0	8.0	0	12.0	8.5	1.0	9.0	7.00
Answers	19.0	19.5	0	31.0	22.0	2.0	20.0	.06
Social phrases	1.0	.5	4.0	.4	.5	1.0	.5	.04
Dramatic imitation	1.5	2.0	3.0	1.7	2.1	8.0	4.5	.06

tion and questions increase with the age of the triplets and egocentric responses decrease.

Count was made of the total number of words used by each triplet in the 50 responses and of the number of different words used. It was found that the number recorded by McCarthy for singletons was from two to three times as large as that obtained for triplets of comparable ages (Table 5).

TABLE 5
WORD COUNT ON McCARTHY LANGUAGE TEST FOR SINGLETONS, TWINS, AND TRIPLETS

		Mean number of different words used			Mean number of words used		
Age	N	Singletons	Twins	Triplets	Singletons	Twins	Triplets
3 years	3	62.8	45.3	35.3	170.3	114.63	139.0
4 years	6	92.6	56.5	26.1	216.3	146.15	102.0
5 years	9		65.3	65.6		158.25	149.2

As in McCarthy's study, analysis was made of the percentage distribution of the several parts of speech in the responses. Two types of percentage were obtained, one based on the total number of words used and the other on the different words used. Tables 4 and 5 present the word analysis of the triplet group compared with the singleton group of McCarthy and the twin group of Day. There are few consistent age changes in the group. The total number of conjunctions and prepositions increases with age; the number of different nouns and adverbs increases; and the number of different articles decreases. Since the changes are slight and are not in agreement with the changes indicating growth in language, they are probably chance and not reliable.

Comparison was made of the language development of the five-year-old triplets and the five-year-old twins reported by Day. The age changes for proportion of parts of speech used show similar trends for twins and triplets in five comparisons and different trends in four comparisons. The triplets use proportionately more simple sentences than the twins and a smaller percentage of complex sentences. On the McCarthy test the triplets show retardation in language development.

Strayer (12) has pointed out in her study of the language development of Twins *T* and *C* that when *C* was placed in a non-speaking environment at the time that she was gaining the maturity to speak, she apparently satisfied her desire for language by engaging in mimicry and gesture. This may have been a carry-over from her behavior with Twin *T*.

On the one hand, secret language and its consequent delaying of speech may be considered a function of the social exclusiveness of the infant multiple-born among whom the desire for the adoption of adult ways is not so keen as in single-born children. On the other hand, delay in speech may be interpreted as indicative of mediocre mentality. Day gives 17 months as the average age at which 160 twins began to talk. Norms for groups of single children are two months earlier than this. Gifted children as a group talk before children of average intelligence, and feebleminded children are much slower than average children.

Day found that the language development of preschool twins was inferior to that of single children as measured by the McCarthy language test. Within the single-born group, children, in one-child families often show language development superior to that of children with siblings. Performance of triplets on the McCarthy test is inferior to that of twins. Although it is uncertain whether this difference would persist in a larger triplet group, we may say tentatively, however, that there seems to be a definite sequence in language development according to the social dependence of the child on adult language—only child in family, single child with sibling, twin, triplet. The only child associates with adults chiefly, the single child with a sibling has the companionship of someone who is fairly near his own level; the twin has a person at his own stage of development who understands his language of gesture and babbling; the triplet has two such companions. This line of reasoning gives us a basis for interpreting why the only child will be the first and the triplet the last to develop comprehensible speech.

C. Language Development of School Age Triplets

The language development of the school-age triplet was measured by the verbal items on the Kuhlmann-Binet test and by the story-invention test. On the former test the scores for vocabulary, sentence invention, word opposites and confused text were relatively lower than for the non-verbal items.

The story invention test was adapted from a linguistic invention test by Meumann (15). Its purpose was to analyze the written language of the school child as the McCarthy test had analyzed the oral language of the preschool child. Because of the different approaches, the techniques for the two types of analyses were different, but use of the story invention test made it possible to follow the structural and functional language development of triplets from preschool to school age. For this test each triplet was instructed to write any type of story desired using five key words. The stories were scored relative to the best in the group of the 44 triplets, ranging in age from 10 to 15 years. There were no definite age changes from year to year, but the most marked division was between the 10-11-year group and the

12-15-year group. Performance on the story invention test suggests that the school age triplet is retarded in language development, but that he approaches the level of the average single-born child more closely than does the preschool triplet. A control study of comparable singleton and triplet population is necessary to confirm this tentative judgment.

D. SUMMARY

The language development of a group of triplets was traced from infancy to adolescence. Information on early development of language of 82 triplets was obtained from questionnaires answered by parents and other relatives. Wherever data were available the triplets were compared with twins and singletons.

Secret language was observed in some triplets. For the most part, the beginning of the secret language was comparable to the age when other children begin to talk.

On the Minnesota Preschool test non-verbal *IQ*'s were higher than verbal *IQ*'s. The boys had higher verbal *IQ*'s than the girls.

On the McCarthy language test for preschool children, triplets were inferior to singletons and twins in the different phases of language development measured by this test. They were consistently retarded behind the single-born, but in some traits were equal or slightly superior to the twins. Speech defects observed in the McCarthy test were found to be common in single children.

The language development of the school age triplets was studied in the Kuhlmann intelligence test and in a story invention test adapted by the writer from a test devised by Meumann. Satisfactory norms were not available but comparisons of their language on this test with related data suggest that school age triplets were inferior to single-born children in traits of language development. The school age triplets are apparently, however, nearer than the preschool triplets to singletons of their own age.

Comparisons between the present triplet and singleton groups are not satisfactory because of the small number of triplets. For the most part, however, the difference between the groups is consistently in favor of the single-born children. Further studies on larger groups of triplets will be necessary to show whether the trend found in this small group is typical of triplets.

REFERENCES

1. DAY, E. J. Development of language in twins. *Child Devel.*, 1932, **3**, 179-199; 1932, **3**, 298-316.
2. GESELL, A. Infancy and Human Growth. New York: Macmillan, 1928. Pp. 418.
3. GOODENOUGH, F. L., FOSTER, J. C., & VAN WAGENEN, M. J. Minnesota Preschool Scale, Form A. Minneapolis: Educational Test Bureau. Pp. 43.
4. MCCARTHY, D. The Language Development of the Preschool Child. Minneapolis: Univ. Minn. Press, 1930. Pp. 174.
5. MEAD, C. D. The age of walking and talking in relation to general intelligence. *Ped. Sem.*, 1913, **20**, 460-484.
6. ———. The relations of general intelligence to certain mental and physical traits. *Teach. Coll. Contr. Educ.*, 1916, No. 76.
7. NICE, M. M. On the size of vocabularies. *Amer. Speech*, 1926, **2**, 1-7.
8. PIAGET, J. The Language and Thought of the Child. New York: Harcourt Brace, 1932. Pp. 246.
9. SHIRLEY, M. The First Two Years, Vol. I. Minneapolis: Univ. Minn. Press, 1933. Pp. 227.
10. SMITH, M. An investigation of the development of the sentence and the extent of vocabulary in young children. *Univ. Iowa Stud. Child Wel.*, 1926, **3**, No. 5. Pp. 92.
11. SOMMER, A. T. The effect of group training upon the correction of articulatory defects in preschool children. *Child Devel.*, 1932, **3**, 91-107.
12. STINCHFIELD, S. M. *The Psychology of Speech*, Boston: Boston Expression, 1928. Pp. 331.
13. STRAYER, L. E. C. Language and growth: the relative efficacy of early and deferred vocabulary training studied by method of co-twin control. Yale Psycho-clinic, 1930.
14. STUTSMAN, R. Mental Measurement of Preschool Children. Yonkers: World Book, 1931. Pp. 368.
15. VAN ALSTYNE, D. Picture Vocabulary Test for Preschool Children. Bloomington: Public School Pub., 1930.
16. WHIPPLE, G. M. Manual of Mental and Physical Tests. (2 vols.) Baltimore: Warwick & York, 1924.

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A STUDY OF THE FRIENDSHIP FLUCTUATIONS OF RURAL BOYS AND GIRLS*

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A. INTRODUCTION

The purpose of this study was to investigate the degree of fluctuation in adolescent friendships. This particular area of adolescent development has not been adequately explored. Adolescence has been described by Hall (5), Allport (1), Benedict (2), and others as a period of marked emotional upheaval—of "storm and stress." This point of view has been vigorously opposed by Hollingworth (6), Dimock (4), and others. In proof of the "storm and stress" assumption it has been frequently pointed out—often without experimental evidence—that adolescent behavior tends to be erratic and fluctuating. If a large mass of experimental evidence were available to demonstrate that adolescents' behavior fluctuates erratically, then one might assume with more confidence that adolescents actually do go through some period of constantly shifting values and partial decisions. However, this substantial body of experimental evidence is not as yet available.

This study is not to be thought of, however, as a test of the hypothesis of storm and stress during the adolescent period, but as an attempt to throw additional light upon the degree of fluctuation in adolescent behavior in one area of their social development.

B. SUBJECTS

The 905 subjects for this study were obtained from four large rural-centralized schools in upper New York State. All of the children from Grades 6 to 12 in these four schools were asked to coöperate in this experiment. These boys and girls live either on farms or in small villages and are brought to school by buses operated by the rural-centralized school systems.

Table 1 presents the numbers of girls and boys at the various chronological-age levels who were employed in this study. The age range of 10

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[1] The writers wish to express appreciation to Dr. R. G. Kuhlen for originally suggesting this research problem.

TABLE 1

Chronological age	Number of girls	Number of boys	Total boys and girls
10	21	18	39
11	46	50	96
12	77	69	146
13	86	90	176
14	88	68	156
15	70	55	125
16	58	45	103
17	38	26	64
Total	484	421	905

through 17 was selected since it is commonly agreed that for all practical purposes the age at which girls become pubescent ranges from 10 through 17, and for boys eleven through seventeen with the average age at pubescence being between twelve and thirteen years for girls and between fourteen and fifteen years for boys (3).

C. PROCEDURE

All children from Grades 6 to 12 in four rural-centralized schools were given a slip of paper upon which the following request was mimeographed:

> Please write below the names of your three best friends, or the people you like best in your classroom. List the one you like best, first; second best, second; and third best, third.

Three numbered lines were provided for the subjects to write down the names of their three best friends. The teacher in each homeroom explained verbally what the pupils were to do, stressing that the best friend's name was to be placed first and that friends outside the school were not to be named.

Two weeks later the children were again requested to list their three best friends in order of preference. Mimeographed slips were distributed which contained the same directions used on the first slip with the following addition:

> The people you list may or may not be the ones you listed two weeks ago. Be sure to write down the ones you like best now.

Nine hundred and five children consisting of 421 boys and 484 girls participated in this experiment.

D. RESULTS

Friendships among rural youth, as measured by the instruments employed in this study, ranged over a two-week period from complete constancy to complete inconstancy. The responses of the majority of the subjects, however, were between these two extremes in friendship fluctuation. To measure these rather complex changes in friendship it seemed desirable to obtain some type of an over-all index of friendship fluctuation.

To provide a comprehensive measure of friendship fluctuation the following analytic procedure was adopted:

(*a*). The three friends chosen by each subject during the second choice situation were compared with the three friends chosen two weeks previously.

(*b*). If the friends chosen the second time duplicated in personage and rank order the friends chosen two weeks previously the index of friendship fluctuation was considered to be zero.

(*c*). If the friends chosen the second time duplicated in personage but differed in rank order from the friends chosen two weeks previously, an index of friendship fluctuation was computed by assigning a numerical value of one to each rank that a friend of the second choice situation was separated from the rank initially assigned to him; e.g., if the original ranking were: like best, John; second best, Bill; third best, Carl; and the second ranking were: like best, Carl; second best, John; third best, Bill; the fluctuation index as computed by this procedure would be four; since Carl is removed two ranks, Bill one rank, and John one rank from the original rankings.

(*d*). If a subject during the second choice situation chose among his three best friends boys or girls whom he had not previously chosen, the following numerical values were assigned to these *new* friends: two for a person not previously mentioned who became the subject's third-best friend during the second choice situation, three for a person not previously mentioned who became the subject's second-best friend, and four for a person not previously mentioned who became the subject's best friend.

(*e*). Table 2 may help to clarify the procedure employed to obtain this over-all index of friendship fluctuation.

TABLE 2

SUBJECT *X*, FEMALE, AGE 13

	First choice situation	Second choice situation (Two weeks later)
Best friend	Ann Collins	Ann Collins
Second-best friend	Betty Reed	Joan Marsh
Third-best friend	Joan Marsh	Shirley Jones
	Friendship Fluctuation Index: 3	

The numerical values assigned to these changes in friendship over a two-week period were, of course, arbitrary; since outside criteria of friendship fluctuation from which one could determine appropriate weightings were not available. Although the numerical values assigned in this study to the various changes in friendship were determined on a rational rather than an empirical basis, the writers, nevertheless, believe that this type of analysis provides suitable data for a crude, over-all index of friendship fluctuation. The possible loss in precision with this type of analysis is, perhaps, more than compensated for by the fact that this analytic procedure enables one to evaluate *simultaneously* all of the complex data on friendship changes.

1. *Indices of Friendship Fluctuation*

The means and standard deviations of the distributions of friendship fluctuation for the various chronological-age levels are presented in Table 3. These data are based on an analysis of the responses of 484 rural girls and 421 rural boys. In this table are also presented the results of statistical comparisons of the distributions of friendship fluctuation of boys and girls at the various age levels.

TABLE 3
SEX DIFFERENCES IN INDICES OF FRIENDSHIP FLUCTUATION

Chronological	Girls		Boys		
age	Mean	*SD*	Mean	*SD*	*t*
10	3.33	2.42	4.67	2.08	1.81
11	3.67	2.43	4.32	2.74	1.22
12	3.44	2.87	3.83	2.84	0.82
13	3.77	2.62	3.76	2.67	0.03
14	3.76	2.95	3.56	2.97	0.40
15	3.11	2.45	3.49	2.52	0.84
16	2.93	2.69	3.55	3.03	1.06
17	2.55	2.19	1.81	2.64	1.15

The *t*'s obtained in the statistical analyses indicate that the small differences in friendship fluctuation between the boys and girls at each of the chronological-age levels can reasonably be attributed to random errors of sampling. From these statistical analyses one cannot reject with a reasonable degree of confidence the null hypothesis that there are no differences in friendship fluctuation between the boys and girls at the various age levels.

The magnitude of the standard deviations for both sexes demonstrates that there are large individual differences in the stability of friendships at all of the chronological-age levels studied. This variability of individual responses further indicates that the measuring instrument is sufficiently sensitive to detect differences between the sexes as well as between the various age groups if such differences did exist.

As shown in Table 3 there appears to be for both boys and girls a trend toward greater stability in friendship with increasing age. The 17-year-old boys and girls demonstrate the greatest stability of any of the age groups studied in choosing the same persons as their three best friends after a two-week interval.

Statistical analyses indicate that the mean fluctuation index of the 17-year-old boys is significantly lower[2] than the means of the other seven male chronological-age groups. The differences between the means of the other male age-groups are not statistically significant at acceptable levels of confidence.

Statistical analyses indicate that the mean fluctuation index of the 17-year-old girls is significantly lower than the means of the 11-, 13-, and 14-year-old female groups. The differences between the means of the other female age-groups are not statistically significant at acceptable levels of confidence.

Since the distributions of friendship fluctuation of the boys and the girls were not found to be significantly different at the various age levels, it seemed desirable to combine the data of both sexes into a composite of rural youth. The means and standard deviations of the distributions of friendship fluctuation for rural youth at the various age levels are presented in Table 4.

TABLE 4

BOY-GIRL COMPOSITE INDICES OF FRIENDSHIP FLUCTUATION

Chronological age	*N*	Mean	*SD*
10	39	3.94	2.37
11	96	4.01	2.62
12	146	3.62	2.87
13	176	3.76	2.65
14	156	3.67	2.96
15	125	3.28	2.49
16	103	3.20	2.86
17	64	2.25	2.38

The means of the friendship fluctuation indices for this boy-girl composite population are also presented graphically in Figure 1. The combined data of these 905 rural boys and girls show a consistent downward trend in friendship fluctuation from year 13 to year 17. The results of statistical analyses comparing the fluctuation indices of each chronological-age group with every other age group are presented in Table 5. The obtained *t*'s indicate that the mean fluctuation index of the 17-year-old rural youth is

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[2] At either the one or the five per cent levels of confidence as determined by the *t*-test (7).

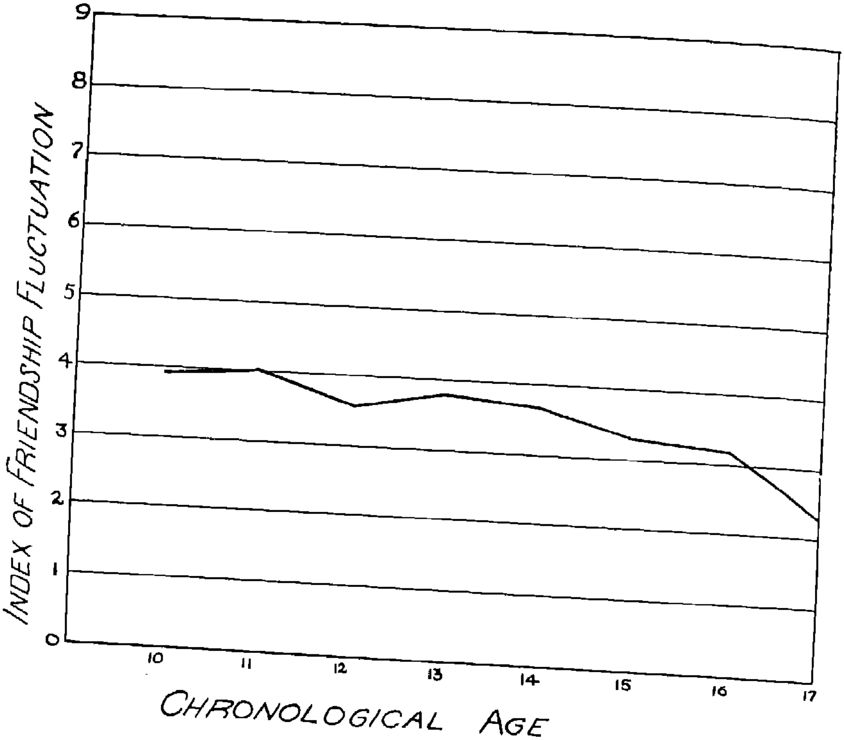

FIGURE 1
THE RELATIONSHIP BETWEEN CHRONOLOGICAL AGE AND FRIENDSHIP FLUCTUATION FOR A RURAL POPULATION OF 905 BOYS AND GIRLS

significantly lower than the means of the other seven chronological-age groups. The means of the 15- and 16-year-old groups are also significantly lower than the mean of the 11-year-old group.

In summary, this type of analysis indicates that there is a trend toward greater stability in friendship with increasing chronological age. These data do not show any upswing in friendship vacillation during the onset and initial phases of adolescence. The inconsistent, mercurial characteristics frequently attributed to adolescents' behavior are not reflected in the relative stability of their friendships as compared with pre- and post-adolescents.

To ascertain what happened to best friends over a two-week period further analyses of the data were made. The results of these analyses are presented in Figure 2. About six out of 10 children of all ages tended to retain the same person as their best friend both times. For either boys or girls there did not appear to be any reliable differences between the different age

TABLE 5*

RESULTS OF STATISTICAL COMPARISONS OF THE DISTRIBUTIONS OF FRIENDSHIP-FLUCTUATION INDICES OF THE EIGHT CHRONOLOGICAL-AGE GROUPS

11	12	13	14	15	16	17	CHRONOLOGICAL AGE
						2.32* (165)	16
					0.22 (226)	2.78** (187)	15
				1.18 (279)	1.27 (257)	3.64** (218)	14
			0.29 (330)	1.60 (299)	1.60 (277)	4.19** (238)	13
		0.44 (320)	0.15 (300)	1.03 (269)	1.14 (247)	3.61** (208)	12
	1.11 (240)	0.76 (270)	0.94 (250)	2.09* (219)	2.08* (197)	4.40** (158)	11
0.15 (143)	0.71 (183)	0.42 (213)	0.60 (193)	1.50 (162)	1.57 (140)	3.52** (101)	10

CHRONOLOGICAL AGE

*In the above table the italicized numbers are the *t*'s for the various chronological-age group comparisons. The numbers in the parentheses represent the numbers of degrees of freedom for the various *t* values. Those *t* values statistically significant at the 5 per cent level of confidence are indicated by a single asterisk; while those significant at the 1 per cent level of confidence are designated by two asterisks.

groups. However, from these data there appeared to be a greater tendency for girls than for boys to select the same person as their best friend in both choice situations.

For the most part, when a new best friend was selected during a second choice situation the subjects tended to select someone previously listed as a second- or third-best friend. However, between one and two out of 10 subjects selected as their best friend during the second choice situation someone not listed previously among their three best friends. There appeared to be no reliable age or sex differences in these latter data.

E. DISCUSSION

From the data of the present study one must conclude that adolescents demonstrate approximately the same degree of stability in their friendships as do pre-adolescents. Moreover, these data indicate that stability of friendship during the adolescent years is an increasing function of chronological age.

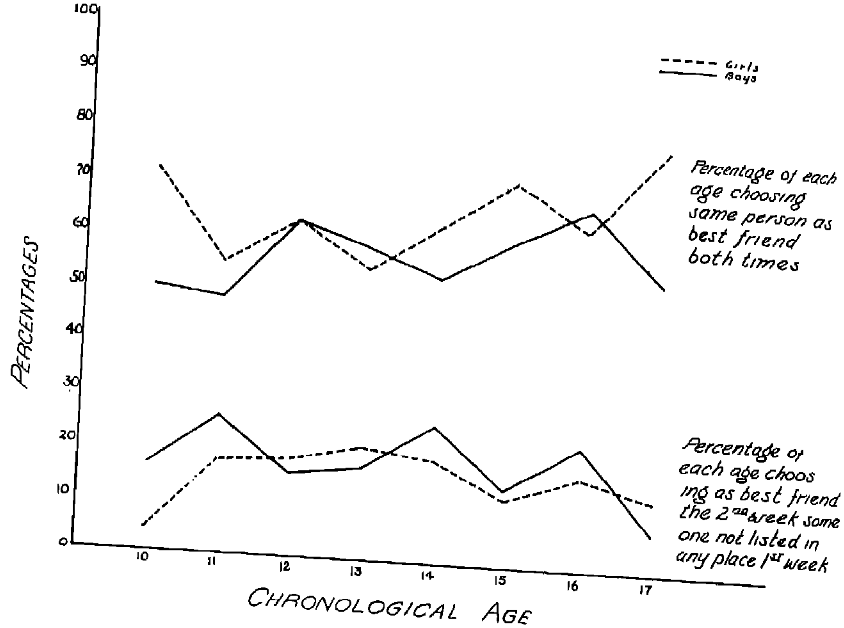

FIGURE 2

As pointed out previously in this report, the present research is not a crucial test of the "*Strum und Drang*" hypothesis of adolescent development, since it is conceivable that adolescents might demonstrate a relatively high degree of stability in this rather narrow area of social development and evidence great instability in many of the other areas of social, emotional, and intellectual development. However, the present findings, along with the negative findings of other investigators, tend to discredit the assumption—which has been based, largely, on chance observation and arm-chair theorizing—that adolescents' behavior is extremely erratic and unstable.

From the analysis of the data on best friends there appears to be considerable fluctuation in friendship at all of the age levels studied. About 10 to 15 per cent of the subjects at the various age levels did not retain their original best friends in any position after a two-week interval. However, it should also be noted that approximately 60 per cent of the subjects at all age levels mentioned the same persons as their best friends in both choice situations. The degree of fluctuation of friendships is probably emphasized in this study by the research instruments employed. It is possible that boys and girls during the adolescent years may have a reservoir of many friends who are almost equally well liked. When asked to name three of his best friends, an adolescent may have extreme difficulty in selecting only three from this reservoir of friends. On what bases can a subject select only three friends from several who are almost equally preferred? It seems reasonable that recent contacts, minor disagreements, and more or less chance factors might influence his selections during the two choice situations and thus indicate a spuriously large amount of fluctuation in friendship over a two-week period.

Selection of a two-week period between choice situations presented certain advantages. A two-week period gave the subjects a time short enough so that they could remember whose names they had used in the first choice situation, but at the same time provided sufficient time to elapse so that changes could occur. That changes did occur during the two-week period is demonstrated by the findings of this study. A period longer than two weeks might have introduced new variables such as the addition of new people moving into the community, long vacations and grade, subject, and home-room changes.

Selection of the age range of 10 through 17 seemed satisfactory, since it provided a several-year range on each side of the average age of pubescence for boys and girls, which allowed an adequate picture of pre- and post-pubescence to be presented. This age range also made for comparative freedom from selective factors in the population being studied since the school law of New York State provides for compulsory school attendance of "all the children of all the people" during these ages. There may, however, have been a selective factor of intelligence or socio-economic status at year 17 since a number of children tend to leave school following their 16th birthday. The present study made no provision for studying the relation between intelligence or socio-economic status and friendship fluctuation.

It would be interesting to extend the age range of the present study beyond the 17th year in order to gain a more comprehensive picture of the effects of added maturity upon friendship stability. Such an attempt was not made, however, due to the operation of selective factors such as intelligence, socio-economic status, marriage, terminal education, the war and vocational opportunities, which year by year limit the number of youth to be found in school and which definitely determine the type of youth who remain in school. For the most part, youth who have left school are not available under optimum or comparable conditions for an experiment such as the present one.

This study has been confined to white youth in New York State who live in comparatively static rural communities. Inclusion of subjects from more fluid communities might well influence the results obtained in this study. Some preliminary data, using two urban populations, indicated differences between urban and rural youth in stability of friendships. The writers plan to collect more data on urban youth to study this difference.

F. SUMMARY

The purpose of this study was to discover the degree of fluctuation in adolescent friendships. Nine hundred and five rural children consisting of 421 boys and 484 girls participated in this study. These boys and girls ranged in age from 10 to 17 years. The subjects were asked to list their three best friends on two occasions, 14 days apart. An analysis which included an index of friendship fluctuation was made of their responses.

Since boys and girls did not differ significantly in friendship fluctuation at the various age levels, the data were combined into a composite of rural youth.

In this rural youth population there is a trend toward greater stability in friendship with increasing chronological age. These data do not show any increase in friendship fluctuation at and following the initial phases of adolescence. A discussion of the relationship of these data to the hypothesis of storm and stress in adolescence is presented.

REFERENCES

1. ALLPORT, G. W. Personality. New York: Holt, 1937.
2. BENEDICT, R. Continuities and discontinuities in cultural conditioning. *Psychiatry*, 1938, 1, 161-167.
3. COLE, L. Psychology of Adolescence. New York: Farrar & Rinehart, 1942.
4. DIMOCK, H. S. Rediscovering the Adolescent. New York: Association Press, 1937.
5. HALL, G. S. Adolescence. (2 vols.) New York: D. Appleton-Century, 1904.
6. HOLLINGWORTH, L. S. Psychology of the Adolescent. New York: D. Appleton-Century, 1928.
7. PETERS, C. C., & VAN VOORHIS, W. R. Statistical Procedures and Their Mathematical Bases. New York: McGraw-Hill, 1940.

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ALBINISM IN NEGRO CHILDREN*

Chicago Board of Education

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Albinism presents a definite physical peculiarity in nature. It is common to both plants and animals. In the animal kingdom it is characterized not only by abnormal whiteness but also by a physio-chemical eye condition. Does the albino present a psychology peculiar to himself? Let us see. Albinism is not a racial characteristic. Problems arising from it differ from a racial viewpoint.

For the past 10 or more years the writer has been observing the problems of albinism in the Negro group. The albino in this group is first of all a Negro in his social classification. The albino is merely a type in the Negro group.

The writer interviewed and gave psychological examinations to 42 Negro albino children. There were 14 boys and 28 girls in the study. The purpose of the study was to observe the development in a group of albinos during a period of 10 years.

The albino has a different appearance from his non-albino sibling. To what extent does this difference affect the social and individual attitudes of albinos? Here the albino will be permitted to speak for himself through case histories so that the reader may see the problems that he faces.

Are albinos as intelligent, more intelligent, or less intelligent than their non-albino brothers and sisters? It will be interesting to see whether intelligence is at all correlated with albinism. Albinos are relatively few in any group. Our first search for them was in the public schools. A questionnaire was sent to nearly all school principals in the city of Chicago stating that the writer was interested not only in the research angle, but also in the adjustment of albinos. Private schools, social and welfare agencies were visited and several hundred Juvenile Court records were read for the purpose of finding additional albinos.

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At each location an exact description of the albino was given. However, teachers, principals, social workers and others recommended children for the study who had only some likeness of the albino. A physician, for example, recommended a patient who had light weak eyes and light hair. Many mistakes are made by the layman in detecting albinism. When albinos were located, the writer and a trained social worker visited the home. In this way rapport was established. After the social history was obtained the writer invited the child to the clinic at the Institute for Juvenile Research for a psychological and educational study. In most cases the albino enjoyed the experience at the clinic.

All of the facts presented in the social histories are accurate as far as the writer could determine. The names of the children will not be used, but the facts will be given with an alias.

A. Case Presentation

1. *The Case of Bill G*

Bill was examined when he was eight years and five months old. On the Stanford-Binet test he obtained an *IQ* of 85, classifying him as slightly below the average in intelligence. He was affable, coöperative and somewhat reflective. He was in low third grade. Bill was an only child, born of old parents. The mother states that the father was 56 and she had passed her 45th year, when Bill "showed up." She was a housewife and possessed a grade school education. The father had very little education, but he was considered smart, with lots of "mother wit." He kept a small shop and was supposed to be a good, "competitor of the Jews who owned most of the shops in the neighborhood," the mother said. Mr. G. was proud of his economic status, particularly the ownership of his home and business. He smiled as he said, "My business is on a strictly cash basis." The implication is a man must be good to run a cash business. Both parents had high ambitions for their albino son. Although they were puzzled and disappointed because their only child was an albino, Mrs. G. said she used to worry a lot about her son's complexion, but she does not any more. Her color is brown and Mr. G. is dark.

Bill is abnormally white in color with a few freckles on the cheeks and forehead. His hair is white and about the same texture as that of his mother. Bill said that he loved school. His ambition was to become a doctor. He enjoyed play with other children. His play activities were normal for his age. He had measles and whooping cough. Bill walked at 15 months and talked at 17 months. He had worn glasses for about three years. He had not attended sight saving classes in school.

After ten years. The growth of a child in 10 years is remarkable. The emotional, social, and physical development are perhaps the important phases from the viewpoint of a psychologist. After 10 years we find Bill *G* a large, fine looking boy. He is now 18 years old and a senior in high school. His grades are average and above. He is attached to his mother and the mother, in turn, is tied emotionally to the boy. The father died during the 10-year period.

Bill wishes he were not an albino. He says that he will go to work if he is not drafted into the Army—after graduating from high school. At 18 he was given another psychological examination, this time on the new Stanford-Binet Form *L*. He rates higher at 18 than he did at eight. He now achieves an *IQ* of 100. He has great difficulty with his eyes. At 18 he manifests very little interest in girls.

2. *The Case of Eve Curt*

Eve was a frowny faced child, small for her six years when we first met her. On the Stanford-Binet she got an *IQ* of 108, classifying her as high average in intelligence. She may be somewhat brighter, her many moods clouding her real abilities. She gave partial coöperation in the test. Reaction time varied with her moods. She was sometimes quick, sometimes average, and sometimes slow. Her attention fluctuated according to the stimulus at hand. It was sustained only when the test of the moment interested her. She could hardly be called subordinate in adaptation because she frequently was challenging. She was seldom indifferent. Sometimes she was warm and cordial and sometimes antagonistic. During the latter mood Eve enjoyed being coaxed.

She walked at 13 months and talked at 16 months. The mother said that Eve matured very fast. As an only child, it was obvious that she was spoiled. Eve was an ivory white albino with long white hair. On the left side there were a few strands of darker hair. Her nutrition was good. The mother said that Eve was seldom sick but she had trouble with her eyes. They were light pink and medium in size. She had been wearing eye glasses for some time when the writer examined her. Although troubled with her eyes, the parents were reluctant to have Eve placed in a sight-saving class. They did not want her to be "different."

On the Stanford-Binet test Eve was good in color combinations except blue. To her blue meant purple.

The parents were middle class, hard working people. The father was light brown and considered "good looking." The mother was light, a sort of pumpkin yellow. She had a grade school education. Her occupation chiefly was day-work. The father was a chauffeur. He had a good job which he held even during the depression years. He was a high school graduate.

After ten years. It took a deal of searching to locate Eve after a 10-year period. She had then passed her 16th birthday. Gone were the moods and temperament of 10 years ago. She was examined on the new Stanford-Binet Form *L*. She received an *IQ* of 115. She is now in the 2B in high school. Her ambition is to be a teacher or a nurse. She is somewhat shy. Eve has made a fairly good social adjustment in the 10-year period.

3. *The Case of Pat Wert*

This child is the oldest of three siblings. She was a dull appearing oversized albino girl who gave partial coöperation in the test. Her reaction time was slow. She was unreflective. Her attention span was short. She was subordinate but indifferent at times. In certain tests she did show a pleasing attitude.

Pat was 15 years of age when she was examined and was in the 7B in a sight-saving class. On the Stanford-Binet she received an *IQ* of 63. This classifies her in the defective group. Pat walked at 18 months and talked at 23 months. The mother said that Pat skipped the 5B grade and was put in a 5A sight-saving class. According to the test her vocabulary was at the 8-year level. She had success on the fables at the 12-year level. She was poor in all other tests above the 10-year level.

She was chalky white in complexion with short white stubborn hair. She had medium sized pinkish oval eyes. She was not over-sensitive about her albinism. The father died the year previous to the testing. The relief agency's record on the family described him as a small dark man who never took seriously the support of his family. He was shiftless and inept. The mother was a medium sized dark woman with a hook nose. She had large brown eyes and may be said to present a severe expression. She was quick tempered.

Mrs. Wert was a poor housekeeper. Household articles were in the middle of the floor, in windows, on the beds—anywhere. Some of the neighbors spoke of Mrs. Wert as the "poorest housekeeper in the block." The other children in the family were:

Lloyd, 12 years old and in the 6B grade. He had an *IQ* of 95 on the Stanford-Binet test. He was well adjusted in school. He said that "the kids at school tease Pat because she is ugly." Lloyd was a dark brown boy with brown eyes.

Inez Mae, 10 years old at the time of the examination. She was in the 3B grade and not considered well adjusted to school life. On the Stanford-Binet she obtained an *IQ* of 71. Pat and Lloyd were born in Mississippi; Inez was born in Chicago.

Ten years later. After 10 years Pat was again examined and interviewed by the writer. She was then a woman of 25 years. Then her *IQ* on the new Stanford-Binet Form *L* was 70. She was unhappy. She was living with relatives. Her work was in a defense plant. When the writer asked her the nature of her duties at the plant she replied, "That's a military secret." She is still single. She started to high school but found the work too difficult.

4. *The Cases of Jimmie and Allen Ober* (*Siblings*)

Jimmie is a non-albino and Allen is an albino. Jimmie was 8 years and 7 months and Allen was 6 years and 2 months when they were examined. Jimmie weighed 64 pounds while his albino sibling weighed 60 pounds. Both boys were coöperative, but Jimmie was quicker in reaction time. Both had average attention, but Allen was more reflective. Jimmie was in the third grade and Allen was in the second grade.

Allen, the albino walked at 13 months and talked at 20 months. He had the baby talk pattern. Jimmie walked at 14 months and talked at 19 months. He did not exhibit the baby talk pattern. Allen had a more pleasing attitude than Jimmie. On the Stanford-Binet Allen received an *IQ* of 98. This classifies him as being slightly below the average in general intelligence. In tests of general comprehension he was below the average. In tests involving numbers and in tests of similarities and differences, he was slightly above the average. In tests involving definitions he was also above the average. Allen has an aptitude in music, specializing in it in high school.

Jimmie differed from Allen in many respects. On the Stanford-Binet he received an *IQ* of 107, classifying him as high average in intelligence. He was good in all tests up to his age level. In tests of memory, logical deduction, and number facility he was successful beyond his age level. Jimmie had no special aptitude comparable to his albino brother's in music. The writer was in touch with Jimmie during most of his high school years. He was not the student in school that his albino brother was.

These boys came from a good home. Both parents were light in complexion. Jimmie was darker than either parent. Allen had small pink eyes and white hair. The parents owned their home and were considered thrifty, good citizens. The mother, a high school graduate was a housewife.

The father was a civil service employee. He was a high school graduate with some further special training. Neither parent appeared to have any attitude about the albinism of Allen.

After ten years. Allen made a fine social, physical, and emotional adjustment in the 10-year period. He is now 16 years of age and is a high school graduate. His rank was 16 in a class of 185. Jimmie ranked 298 in a class of 315. On the new Stanford-Binet Form *L* Allen received an *IQ* of 105. This is a considerable increase over the rating of 88 he got when he was six years old. The present rating was checked on a Kuhlmann-Anderson test because the psychologist was inclined to doubt the authenticity of the second *IQ*. On the Kuhlmann-Anderson Allen got an *IQ* of 102.

Allen was popular in high school. He says that he does not worry much but he would prefer not to be an albino. His eyes continue to trouble him. His good adjustment to his personal problems and to life is due in a large measure to a good home and understanding parents. He is still interested in music and is seriously considering making it his career.

5. *The Case of Ed. S. Jay*

Jay was examined by the writer when he was about nine years old. He gave full coöperation in the testing. He was slow and unreflective. He had average attention span. He was friendly and cordial in attitude. He was in the fourth grade at the time of the examination. On the Stanford-Binet he achieved an *IQ* of 111. This classifies him as superior in intelligence.

Jay began school at five years and was fond of school. At the time of the examination he weighed 62 pounds. His developmental history indicates that he walked at 12 months and talked at 15 months. His father was brown in complexion with gray eyes and was 42 years old at the time of the examination. He was a high school graduate and a good decorator. The mother, 38 years old, was brown in complexion with brown eyes. She had a grade school education. Both parents were strict Christians. Both were ambitious for their albino son who was their only child.

There had been some concern about Jay's health in early childhood. This anxiety had passed at the time of the examination. Although superior in general intelligence he liked to play with children who were younger. His recreational activities were below his age level. Jay reports, "I dream a lot every night but I forget them." His ambition was to become a decorator or a policeman. Jay was a typical albino with white skin, pink eyes, and white hair. He wore eye glasses and complained about his eyes only under bright lights and in sunlight.

Ten years later. After a period of 10 years Ed. S. Jay was again examined and interviewed. He was 19 years of age at the last examination. On the new Stanford Binet Form *L* he received an *IQ* of 109. After a period of 10 years there was a difference of only two *IQ* points between the tests. This has little significance when it is realized that a fluctuation of six *IQ* points between two tests is within a normal expectancy.

Jay finished the elementary school and completed about two and a half years in high school. At the time of the examination he was awaiting a call to service in the United States Army. He still wears eye glasses but he reports that his eyes are now "pretty good." He is undecided on a vocational career.

6. *The Case of John A. Dee*

John was curious about the test. He was very coöperative; reaction time was average; attention was well sustained. He had a cordial attitude. On the Stanford-Binet examination he received an *IQ* of 92, classifying him in the low average group for general intelligence. John was in the second grade in the sight-saving class at the time of the examination. He was a typical albino with white skin, white hair, and pink eyes. He is an only child. His health was not considered good. He was nine years old, weighing 58 pounds. He walked at 16 months and talked at 18½ months. John's mother was dead and he had a step mother. From all indications she was fond of her albino step-son. The father was 38 years old and did common labor as a means of livelihood. Mr. Dee was yellow in complexion. John's mother was brown. Mr. Dee had very little education but he had been thrifty as a laborer. He was buying his home which was neatly kept. Mr. Dee's present wife was a hairdresser. She said that John was "alright and particularly handy around the beauty shop."

After Ten Years. The writer kept in fairly close touch with John during the 10-year interim. Several times John requested the writer to give him a test. At age 19 he has matured into a fine appearing lad. This time he was examined on the new Stanford-Binet Form *L*. He was quite coöperative. He enjoys being on exhibition. At age 19 he gets an *IQ* of 105, the classification of high average. This represents a gain of 13 *IQ* points in 10 years, which may be due in part to the revision of the test. John is now a high school graduate. He was rejected for the Army on account of his eyes. John has made a good educational adjustment in the 10-year period. His social and emotional adjustments have been fair. He is employed in a government defense industry. John is disappointed because he was rejected for the army. He is sorry also that he is an albino. He is "going steady" with a girl whom he plans to marry.

7. *The Case of Hazel Rugg*

Hazel was a fine looking albino girl with large pink eyes. She was seven years old at the time of the examination and interview. She gave only partial coöperation in the testing. Her reaction time was quick and she was usually reflective. Her attention was sustained. She was cordial in attitude with a sweet expression. On the Stanford Binet she received an *IQ* of 92, classifying her as low average in intelligence. It was necessary to coax her on a few tests. She was good in tests of memory; vocabulary was equal to her age level. She was excellent in tying a bow knot and copying a diamond with pen and ink, indicating that she was mature in the use of small muscles. She was confused in solving certain problems and tests at the fifth and sixth year levels. She was in the second grade, not in a sight-saving class, although that seemed desirable. She wore glasses, but was still having difficulty with her eyes. She weighed 50 pounds at the time of the examination. She walked at 16 and talked at 20 months. The mother reported that Hazel had no food fads and that she willingly ate "spinach and everything." She was milky white with a few freckles on the upper forehead. She had short white hair. She frequently attempted to adjust her vision by turning her head to the side. She was the oldest of three siblings. The others were:

R.D., a boy five years old at the time of the testing. He was brown with brown eyes and a small mouth. Examination on the Stanford Binet found him to have an *IQ* of 110, placing him in the group of superior intelligence.

Buddy, also a boy, four years old at the time of the examination. Buddy received an *IQ* of 95 on the Stanford-Binet. He is classified as average in general intelligence. There is practically no difference between the tested intelligence of Hazel, the albino, and Buddy, her brown younger brother.

Mr. Rugg was a serious looking light brown man. He wore a "Hitler moustache," and had flashing eyes. He was a factory laborer. He appeared to be a dutiful and proud husband and father. He admitted that he was sorry that Hazel was "unnatural," but he said, "It's the Lord's will." Mrs. Rugg was much younger than her husband. She was a plain looking woman, brown with black hair and dark eyes. She claimed that she did not worry any longer about Hazel being an albino. "Maybe she will grow darker like the rest of us," she said. Mrs. Rugg was a laundress. The children were in the care of their grandmother most of the time. The house was neat and clean. The Ruggs apparently were happy together and both were ambitious for their children.

Ten years later. It was difficult to locate the Rugg family after 10 years. Hazel, now 17, retains some of the characteristics of 10 years ago. She quit school before finishing the grades. She works in a small department store. She agreed reluctantly to take the test. On the new Stanford-Binet Form *L* she received an *IQ* of 94 which is a gain of two *IQ* points in 10 years. She is still sensitive about her albinism. Hazel has made a poor emotional adjustment in the 10-year period.

8. *The Jock Family*

The Jock family presents an interesting study in albinism where several members of the family are albinos. Mr. Jock, the father was a soft spoken man, mild mannered, medium build. He was dark with dark frizzly hair. Mrs. Jock was the blustering type. She was brown, inclined to be plump, with large sleepy eyes. She had silky long black hair. The father was 47 and the mother was 43 at the time of our interview and examination. The father was a plumber. The family attends a religious cult. There had been a deal of bickering in the family in earlier years. The father was suspicious of albinism. The family physician explained to the father that albinism is a sport in nature, and that it did not mean unfaithfulness on the part of his wife. This tension had worn off somewhat when the writer met the Jock family. The ordinal positions of the members of the family are given in Table 1. The albinism in the Jock family seems to set a rhythm: Albino, Dark, Brown, Albino, Dark, Brown, Albino, Dark. It was not possible to get test data on the two oldest siblings. At the time of the examination Fenton was in the 1A grade of high school. His report card was not very promising. Emily, the 15-year-old albino was in the 1B grade of high school. Her progress was fair. She said that she was fond of school. She gave full coöperation in the testing. She was slow and her attention span was limited. She was cordial in attitude. Emily walked at 14 months and talked at 18

TABLE 1

Name	Age	Color	*IQ*
Jimmie	21	Albino	No test
Ruth	20	Dark	No test
Fenton	16	Brown	88
Emily	15	Albino	82
Betty Lou	11	Dark	97
Louis	8	Brown	85
Dessie	6	Albino	105
Kurt	5	Dark	90

months. She enjoyed playing, particularly with younger children. Emily said that her favorite in the family was Ruth, the oldest sister.

Betty, the 11-year-old dark girl, walked at 13 months and talked at 18 months. Her developmental history was faster than that of her 15-year-old albino sister. There is nothing outstanding about Louis, the 8-year-old brown boy except his interest in things mechanical. His teacher said that he was adept at taking things apart and putting them together again. He walked at 13 and talked at 17 months.

Dessie, the 6-year-old albino, was the brightest in the family. On the test she was shy and gave only partial coöperation. She enjoyed play with others of her age. She liked jump-rope, hop-scotch, and turn-over. Dessie walked at 18 and talked at 20 months. At the time of the examination she was in the second grade, her teachers describing her as a bright and lovely child. Dessie gets an *IQ* of 105 on the Stanford-Binet test.

Kurt, the baby, was five years old when he was examined. He walked at 12 months and talked at 18 months. The albinos in the family have the highest and the lowest *IQ*'s.

Ten years later. The writer was particularly anxious to follow up on the Jock family during the 10 years. The family moved about a great deal during that period. A number of changes have come about in the family.

Emily, the albino, reflects discontent and unhappiness. She is now 25 years old. She was reluctant about taking the test but was more willing in the interview. She had married but did not make a good marital adjustment. After graduating from the eighth grade she quit school. After a good deal of psychotherapy, Emily finally decided to take the test. On the new Stanford Binet Form *L* she received an *IQ* of 91 which is a little gain over the *IQ* of 1934. She appears to have a "chip on the shoulder" attitude toward most of the members of her family. She is quite unhappy over her lot in life. She wishes she were not an albino and she thinks somebody is to blame for it although she does not say who that "somebody" is. She was employed at a chain store when last seen.

Dessie, the other albino member of the family who was examined in both 1934 and 1944, presents a different picture. She is now 16 years of age and is cheerful and bright in attitude and spirit. She was a little timid but coöperative. On the new Stanford-Binet she received an *IQ* of 102, representing a loss of three *IQ* points. Dessie is in the second year of high school. Her report card shows average and better than average grades. She appears to be the best liked member in the Jock family. She still has difficulty with her eyes and is somewhat sensitive about her albinism. She does not exhibit much enthusiasm about boys.

9. *The Case of Betty Cye*

Betty was examined when she was a high school senior. She gave fine coöperation in the test. She said that she was interested in a commercial career. She wore eye glasses and admitted that her eyes gave her much trouble. Betty was an only child. Her father died the year previous to the testing. He was a lawyer. She does not expect to go to college she said because, "I must take care of my mother." Betty was creamy white with small pink eyes. She did not have surface sensitivity about her albinism. Her hair was white and bobbed. She admitted that she sometimes dyed it. She said, "This is OK because I pass for white and get a better job."

Betty walked at 12 months and talked at 14 months. She had lost one year in school on account of illness.

Her mother was a large, excitable woman who was emotionally tied to her daughter. She was dark yellow in complexion with small dull eyes and long black hair. She said that Betty's father was brown, of medium size "with beautiful eyes, a pretty mouth, and a kind expression. "He was good to me and the child." When asked if the father had any attitude about Betty being an albino, the mother replied, "If he did, he never told me so."

Betty was eighteen years old when examined on the Stanford-Binet. She received an *IQ* of 104, classifying her as average in intelligence. She was good in tests of rote and logical memory. She was able to repeat the thought of a passage at the test's highest year level. When asked to state her three wishes, Betty gave these:

> 1—To get a good job and take good care of my mother.
>
> 2—To get married and have a good husband and good children who look natural.
>
> 3—To have good eyes and always be well.

Ten years later. At 28, Betty was an amiable young woman, pleasant and coöperative. She readily agreed to be interviewed and to take the test. On the Stanford Binet Form *L* she received an *IQ* of 96, a loss of eight *IQ* points after 10 years. She is now married and apparently happy. She is glad that her two children are not albinos. After graduating from high school Betty took a secretarial course in the evening. She does secretarial work in a government agency. She has made a fine social, educational and emotional adjustment.

10. *The Case of Jess Allen*

Jess was a five-year-old girl at the time of the examination. She weighed 55 pounds and had good nutrition. Developmental history indicated that

Jess walked at 16 months and talked at 22 months. She had small, dancing, pink eyes. She had already had measles, whooping cough, mumps, and scarlet fever. On the Stanford-Binet test she achieved an *IQ* of 72, classifying her as borderline between dull and defective mentality. She gave the impression through social adjustment of being of higher mental ability. In tests of judgment she was very low. Her speech was indistinct. It was evident that she was accustomed to "baby talk." She was good in tests of memory.

Jess was the only child of an unwed mother. The mother was tall, rather good looking, olive in complexion, with eyes and expression resembling the oriental. She was none too strict in her moral code. She had a court record and was known to have had sexual relations with men since she was 16 years old. The court described her as being unstable and flighty. The mother admitted that she had been intimate with several men and she did not know who was the father of Jess. The mother had two years of high school but her record there was very poor.

Jess was creamy white in complexion with no freckles and straight, regular features. Her hair was medium in length, white and of about the same texture as that of her mother. Placing of Jess in a foster home had been considered by the court. The mother, 19 years old when Jess was born, was a sporadic worker and was on the relief roll much of the time.

After ten years. After 10 years Jess was located only through court record. The mother is now dead. The court supervises Jess in a foster home, where she gets along very well. Her vision is still poor. She has glasses, but reports that they do not help her much. She is small for her age. Most of her girl associates are younger than she. Jess has made a fair social adjustment considering her background. Her emotional adjustment has been excellent. The foster mother has some concern about Jess' interest in boys. Her social maturity still suggests greater intellectual maturity than the test reveals. She is a good example of the constancy of the *IQ*. At five years of age the Stanford-Binet gave her an *IQ* of 72. Now in her 15th year, the new Stanford-Binet, Form *L* gives her an *IQ* of 70. She is in the 7B grade in a sight-saving class where her record is poor. She has no attitude about albinism.

11. *The Cases of Rita, Lita, and Lena—Siblings*

This is the case of Rita Nelson and her non-albino siblings. Their ordinal positions are: Lita, non-albino, is dark. Rita, albino, is chalky white in complexion with dull pink eyes and no freckles. Her hair is medium in length, somewhat woolly and unmanageable. Lena, non-albino, is medium brown. Her hair, like that of Lita, is of a smoother texture than Rita's.

The three girls were given the Stanford-Binet test. Lita was eight years and nine months old. She received an *IQ* of 78, classifying her as borderline in intelligence. Rita, the albino, was six years and 11 months old. She earned an *IQ* of 86. Rita was coöperative on the examination, but sensitive. Lena was five years and six months old. Her *IQ* was 79. Each of the girls appeared to have a different attitude toward the examiner. Lita was indifferent. Rita was shy and perhaps suspicious. Lena was the most affable of the three. Although none of the Nelson children are bright, it is interesting to note that the albino had the highest *IQ*.

Maturation in these three sisters was interesting. Lita walked at 12 and talked at 16 months. Rita, the albino, walked at 16 and talked at 18 and a half months, while Lena walked at 18 and a half months and talked at 18 months.

These children came from poor stock. The father was a ne'er do well. The mother was a neurotic and in bed most of the time. The children were left to the care of their grandmother who apparently loved them but was careless, slovenly, and a very poor housekeeper. The father was in and out of the home, depending on his whims. He was dark yellow, tall and had large, bright eyes. The mother was light brown and small.

After ten years. The writer saw these children occasionally during the 10-year interim. Rita, the albino, attended high school for nearly two years. Her grades were low, and she made a poor adjustment to high school life. Lita and Lena were also poor in school and did not attempt high school work. Only Rita was examined after the 10-year period. She is now 16 years old. On the new Stanford-Binet Form *L* she got an *IQ* of 91, which classified her as low average in intelligence. Her sensitiveness continued throughout the years and she developed a feeling of inferiority. She was sensitive about her color and her hair. When asked to state her three wishes she said:

> 1—To become the kind of woman God wants me to be.
> 2—To be a fine nurse and be kind to my patients.
> 3—To have a pleasing personality so people will like me.

B. THE DISTRIBUTIONS

The age distribution of the boys is from five to nine years. The mode is at year six with four boys (Table 2). The boys have a much shorter range than the girls. There was no difference in coöperation of boys and girls according to age. It is regretted that there were no boys at the upper age range in 1934.

TABLE 2

AGE DISTRIBUTION OF THE 42 ALBINOS AT THE TIME OF THE FIRST TEST

Year intervals	Boys	Girls	Both
3- 3.99	0	2	2
4- 4.99	0	2	2
5- 5.99	3	2	5
6- 6.99	4	5	9
7- 7.99	1	2	3
8- 8.99	3	3	6
9- 9.99	3	2	5
10-10.99	0	1	1
11-11.99	0	2	2
12-12.99	0	2	2
13-13.99	0	1	1
14-14.99	0	1	1
15-15.99	0	2	2
16-16.99	0	0	0
17-17.99	0	0	0
18-18.99	0	1	1
Total	14	28	42

There are 28 girls in the study. Their mode was also six years with nine girls at that year level. The girls range in age from three to 18. They are both younger and older than the boys. The average age for the boys was seven and a half years. The older boys (ages eight and nine) appeared more self-conscious than those at the lower ages. The average age for the girls was eight years. One of the 15-year-old girls was very shy. The other 15-year-old girl was normal in attitude and presented a fine social adjustment. The girls in the lowest age brackets were apparently not conscious of themselves as being greatly different in appearance from their older siblings. One peculiarity, namely, tinting the hair was found in a 12-year-old girl. The mother said that this child had always been dissatisfied with the albino features, particularly her hair.

The average age for walking with the boys was 14 months. The girls' average was 15½ months. The mode for the girls was 16 months. There were seven girls who walked at this age. The range for the boys was from 12 to 16 months. The girls' range was from 12 to 18 months. When we take the boys and girls together we have a bi-modal distribution which appears at the 12th and 16th month levels. The average for boys and girls was 14.9 months (Table 3).

The boys' average age for talking was 18.2 months. The girls' average age for talking was 18.5 months. There is practically no difference in the average age for boys and girls for on-set of speech. The curve for the boys was multi-modal at the 15th, 18th, and 19th months. The distribution

TABLE 3
AGE OF WALKING FOR ALBINOS

Month interval	Boys	Girls	Both
12-12.99	5	5	10
13-13.99	2	2	4
14-14.99	2	5	7
15-15.99	2	2	4
16-16.99	3	7	10
17-17.99	0	1	1
18-18.99	0	6	6
Total	14	28	42

curve for the girls was also multi-modal at the 14th, 16th, and 20th month levels. The girls have a longer range than the boys at both the upper and lower ends of the scale distribution. The mode for both boys and girls was the 18th month with nine at that level (Table 4).

TABLE 4
AGE OF TALKING FOR ALBINOS

Month interval	Boys	Girls	Both
14-14.99	0	4	4
15-15.99	3	1	4
16-16.99	1	4	5
17-17.99	2	2	4
18-18.99	3	6	9
19-19.99	3	2	5
20-20.99	2	4	6
21-21.99	0	1	1
22-22.99	0	2	2
23-23.99	0	2	2
Total	14	28	42

The average *IQ* of the boys is 98.5, hence they are classified as having average intelligence (Table 5). The girls' average *IQ* is 95, also average in intelligence. We have 53.8 per cent of the girls with *IQ*'s below 90 and 28.5 per cent above 90. In the range 90-99 we have 17.6 per cent. Only one girl had an *IQ* above 109; she was a three-year-old who tested 115.

The *IQ* range for the boys was from 78 to 118, while that for the girls was from 63 to 115. It is interesting to note that 21.3 per cent of the boys have superior intelligence and 21.3 per cent are below the average in intelligence. This means then, that 57.4 per cent of the boys are average in intelligence. The brightest boy has an *IQ* of 118. He was five years old at the time of the examination. The dullest boy had an *IQ* of 78. He was six years old.

TABLE 5
DISTRIBUTION OF INTELLIGENCE OF 42 ALBINOS

IQ interval	Boys	Girls	Both
110-119	3	1	4
100-109	3	7	10
90- 99	5	8	13
80- 89	2	7	9
70- 79	1	4	5
60- 69	0	1	1
Total	14	28	42

Both boys and girls are in the lower as well as the upper brackets in intelligence. The girls have a longer range than the boys. There are twice as many girls as boys in the study.

Comparison of the *IQ*'s of the albinos with their non-albino siblings is in order. In three families the average *IQ* of the albinos was below the average *IQ* of their non-albino siblings. In two families the average *IQ* of the albinos was above the average *IQ* of their non-albino siblings. In the Wert, Ober, and Rugg families the non-albinos appear to be slightly more intelligent. In the Jock and Nelson families the superior intelligence seems to be on the side of the albinos. From these data it appears that albinism has no special influence in intelligence. The albinos are about the same in intelligence as their non-albino siblings.

In Tables 2, 3, 4, and 5 we have a distribution of all albinos in the study who were interviewed and examined in 1934. In Table 6 we list the albino boys and girls of the original 42 who could be found in 1944. Only 12 of the original study could be located. We had eight girls and four boys for a second interview and examination. Table 6 shows the difference in *IQ*

TABLE 6
INTELLIGENCE OF ALBINOS ON RETEST

Name	1934		1944	
	Age	*IQ*	Age	*IQ*
Eve Curt	6	108	16	115
Dessie D.	6	105	16	102
Betty Cye	18	104	28	96
Hazel Rugg	7	92	17	94
Rita	6	86	16	91
Emily J.	15	82	25	91
Jess A.	5	72	15	70
Pat Wert	15	63	25	70
Ed Jay	9	111	19	109
J. A. Dee	9	92	19	105
Allen O.	6	88	16	105
Bill G.	8	85	18	100

between 1934 and 1944 of the 12 albinos who were located after the 10-year interim. The 1934 testing was obtained on the old form of the Stanford-Binet. The 1944 ratings were obtained on the new Stanford-Binet, Form *L*. From these data it appears that the latter scale is satisfactory for measuring the abilities of Negro children even though no Negroes were included in the standardization of the test.

C. RESULTS AND CONCLUSIONS

Albinos have some definite problems, particularly those of family and personal adjustment. The albino in a family may be said to have a minority problem—a problem of discrimination. He looks different from the rest of the family and he is often treated differently. Of course this should not be; but too often it is the situation. It was the appeal to help in their personal problems that enabled the writer to get coöperation from these albinos. It is not within the province of this article to discuss the psychological help rendered. That will be reported elsewhere. We must here satisfy ourselves with the observation of test differences, social histories, and factors such as attitudes, interests, and accomplishments.

1. Many Negro albinos even at an early age develop a feeling of insecurity in their homes and in society generally because of the discrimination against them and feeling of "being different."
2. Psychological and psychiatric treatment are often necessary to help them face their problems.
3. Albinos have acute visual problems. It is the duty of parents, teachers, and other persons concerned to see that these children obtain the best visual care possible.
4. The intelligence of albinos is about the same as their non-albino siblings.
5. Physical development of the albinos seems somewhat retarded as regards beginning of walking and talking.
6. There is need of better understanding of the albino problems in the schools and at home. The albino should be treated in accordance with this enlightened view.

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SHORT ARTICLES AND NOTES

The Journal of Genetic Psychology, 1946, 69, 217-220.

ON THE APPLICATION OF VIENNESE INFANT SCALE TO PEIPING BABIES*

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This paper aims at bringing out differences in performance between babies aged within 12 months of two races and cultures through the use of an infant scale which has been standardized on one of the populations. The scale used was C. Bühler's early tests for measuring the development of infants (1). The materials for testing and procedures described therein were followed as closely as possible. Twenty-six female infants of Peiping Foundling Nursery (Yü-ying-t'ang) were used as subjects. The smallness of the sampling was due largely to the limited number of infants within 12 months of age at our disposal. It was however, believed that this sampling was homogeneous and suitable for our purpose of study. All the cases were tested in a specially screened room after feeding hours on Saturday afternoons. It took about one afternoon to test two cases. No case with any pediatric diagnosis was included in this study. The average chronological age (in days) or *CA*, developmental age or *DA*, Development Quotient or *DC*, and body weight (in kg.) are presented in Table 1. It is apparent that the Viennese scale rated the Peiping babies too high at the lower age level and too low at the upper age level. Table 2 and Table 3 give the average percentages of success-performances of each age group

TABLE 1
AGE DIFFERENCE IN *DQ*'s

Age in months	No. cases	Av. *DA*	Av. *DQ*	Av. body wt.
1- 3	12	81.1	116.89	3.448 kg
4- 6	6	131.5	86.88	4.508 kg
7- 9	5	174.3	72.50	5.729 kg
10-11	3	255.8	79.25	6.428 kg

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TABLE 2
AVERAGE PERCENTAGE OF SUCCESS-PERFORMANCES OF EACH AGE GROUP ON BÜHLER'S FOUR CATEGORIES OF TESTS

Age (mos.)	1	2	3	4	5	6	7	8	10	11	Total
Social test	78	45	50	57	—	75	33	54	44	33	52.1
Bodily test	50	41	40	52	—	65	47	22	8	26	39.0
Mental test	35	46	57	45	—	55	41	33	32	49	43.7
Manual test	28	38	42	58	—	38	42	24	25	43	37.6

TABLE 3
PERCENTAGE OF SUCCESS-PERFORMANCES OF SUBJECTS ON EACH AGE LEVEL OF TESTS

Month level	2	3	4	5	6	7	8	9	10	11	Average
No. of cases	16	17	19	20	11	11	9	6	5	5	
Social	100	82	37	35	73	18	11	58	35	0	43.8
Bodily	92	53	39	31	42	32	11	9	0	0	30.8
Mental	70	67	56	36	34	36	37	28	15	18	39.6
Manual	69	53	36	60	9	33	11	67	0	0	33.8

according to Bühler's four categories of tests and the percentages of success-performances of all the subjects tested on items of different age levels, respectively. An item analysis of the tests reveals the fact that the scale can roughly be trichotomized into three types, namely, (*a*) the valid tests, i.e., the increase in percentage of success-performances is proportional to the increase in age; (*b*) tests showing no differentiating power with respect to age-differences; (*c*) invalid tests; i.e., the increase in percentage of success-performances is inversely proportional to the increase in age. Although the number of our cases was small, the decreasing or increasing tendency of the number of success-performance throughout the entire age range does bear out tremendous importance in demonstrating the validity of the scale when applied to Peiping infants. Thus, it seems to be worthwhile to give the different test items in detail. To Type *A* belong these following items (month levels are represented by Roman figures before tests): II Fright at a loud sound, II Searching head movement during a prolonged sound, II Cooing, III Returning glance with a smile or cooing, IV Lying supported only by the palms of hands, IV Grasping a touched object, IV Positive reaction to light, IV Looking at an object while moving it, V Positive reaction to sound, V Looking for a lost toy, VI Imitating facial expression, VIII Pushing away a stimulus, VIII Losing Interest in a repeated stimulus, VIII Imitating knocking, VIII "Paper test," IX Arousing an adult's attention, IX Curiosity for that which is hidden, IX Destructive activity, X Turning in astonishment to an adult, XI Fear of the unfamiliar. To Type *B* belong these following tests: II Response to adult's glance, II Head movement of flight, II Focusing on an object, III Following moving object with eyes, III Reaction to the disappearance of a human face, V Active looking about in a new situation, IV Diaper experiment in lying position, VI Active seeking contact, IX Becoming accustomed to a strange adult. (These 9 tests are too easy) VI Imitating sound, VI Manipulation on a stationary object with a moving object, VIII Sitting alone, VIII Reaching for an object outside the crib, IX Playing cuckoo, IX Grasping two objects while sitting alone, IX Imitating opening and shutting the picture box, IX "Pocket test," X Standing with support, X Diaper experiment while sitting alone, X Throwing objects, X "Glass plate test," X Imitating ringing the bell, X Memory test, X Opening a box, XI Organized play, XI Rising to the sitting position, XI Imitating beating two spoons together, XI Imitating sounds, XI Careful handling of a block, XI Fitting hollow blocks into one another, XI Opening a box (the above 22 tests are too hard). To Type *C* belong these following tests: VI Sitting with support, VII Diaper experiment in supported sitting position, VIII Crawling, VIII Neutral reaction to single stimulus, IX Understanding gestures, IX Kneeling with support.

When the subjects were regrouped into only three age categories, the average *DQ* and σm for each age level are as follows:

1- 3 months: Average $DQ = 114.1$, $\sigma m = 5.29$
4- 7 months: Average $DQ = 82.0$, $\sigma m = 3.85$
8-11 months: Average $DQ = 77.9$, $\sigma m = 2.51$

The age group of 1-3-months-olds was significantly superior to both groups of 4-7-month-olds and 8-11-month-olds (with a critical ratio of 4.9 and of 6.2 respectively), but no significant difference was found between age group of 4-7 months and group of 8-11 months (critical ratio is .90). Some of the relationship between the various measures might be best revealed by the following correlation coefficients:

r between *CA* and *DQ*: —.602±.085
r between *DA* and body weight: .872±.032
r between *DA* and *CA*: .955±.011
r between *CA* and Body weight: .844±.039
r between *DA* and body weight with *CA* partialled out: .25
r between split halves (odd vs. even) of the test items: .19, corrected by Spearman-Brown formula: .32
Rho between the number of success-performances above the mid-line of the scale and the number of failures below it: .38±.12

In summary, we applied Bühler's tests to 26 Peiping female infants and found an average *DQ* of 96. The correlation between *CA*'s and *DQ*'s was found to be −.60±.09 and the younger infants of 1-3 months were significantly superior to those from 4 to 11 months of age. There seems to be little correlation between *DA* and body weight. There were 20 per cent of the test items proven to be valid when applied to Chinese babies, 31 per cent of them showing no differentiating power between different age-groups, being either too easy or too hard, 6 per cent of them proven to be definitely invalid, and the remaining 43 per cent found to be of little or no value. However, it is of considerable interest to compare the difference in the performances of the Viennese and Peiping babies especially from the cultural and racial points of view. Further application of this type of scales to a large sampling is desirable.

REFERENCE

1. BÜHLER, C. First Year of Life. (Translated by P. Greenberg and R. Ripin.) New York: Day, 1930.

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BOOKS

The *Journal of Genetic Psychology*, the *Journal of General Psychology*, and the *Journal of Social Psychology*, will buy competent reviews at not less than $2 per printed page and not more than $3 per printed page, but not more than $15.00 for a single review.

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(1943)

GESELL, A., & ILG, F. L. Infant and Child in the Culture of Today. New York: Harper, 1943. Pp. 399.

LEEPER, R. W. Lewin's Topological and Vector Psychology. Eugene: Univ. Oregon. 1943. Pp. 218.

YERKES, R. M. Chimpanzees: A Laboratory Colony. New Haven: Yale Univ. Press, 1943. Pp. 321.

YOUNG, P. T. Emotion in Man and Animal. New York: Wiley, 1943. Pp. 422.

MASSERMAN, J. H. Behavior and Neurosis. Chicago: Univ. Chicago Press, 1943. Pp. 269.

MAY, M. A. A Social Psychology of War and Peace. New Haven: Yale Univ. Press, 1943. Pp. 281.

WOLFF, W. The Expression of Personality. New York: Harper, 1943. Pp. 334.

ESTABROOKS, G. H. Hypnotism. New York: Dutton, 1943. Pp. 249.

BARKER, R. G., KOUNIN, J. S., & WRIGHT, H. F. Child Behavior and Development. New York: McGraw-Hill, 1943. Pp. 652.

NEWCOMB, T. M. Personality and Social Change. New York: Dryden, 1943. Pp. 225.

MCGRAW, M. B. The Neuromuscular Maturation of the Human Infant. New York: Columbia Univ. Press, 1943. Pp. 140.

CHILD, I. L. Italian or American? The Second Generation in Conflict. New Haven: Yale Univ. Press, 1943. Pp. 208.

GRIFFITH, C. R. Principles of Systematic Psychology. Urbana, Ill.: Univ. Illinois Press, 1943. Pp. 718.

MEIER, N. C. Military Psychology. New York: Harper, 1943. Pp. 395.

STRONG, E. K., JR. Vocational Interests of Men and Women. Stanford University: Stanford Univ. Press, 1943. Pp. 746.

TOMKINS, S. S. (*Ed.*) Contemporary Psychopathology. Cambridge: Harvard Univ. Press, 1943. Pp. 600.

HULL, C. L. Principles of Behavior. New York: Appleton-Century, 1943. Pp. 422.

(1944)

CANTRIL, H. Gauging Public Opinion. Princeton: Princeton Univ. Press, 1944. Pp. 318.

HUNT, J. M. (*Ed.*) Personality and the Behavior Disorders. (2 vols.) New York: Ronald Press, 1944. Pp. 1242.

(1945)

MURPHY, G., *Ed.* Human Nature and Enduring Peace. New York: Houghton Mifflin, 1945. Pp. 475.

FREUD, A., *et al.* (*Editors*). The Psychoanalytic Study of the Child. (An annual, Vol. 1.) New York: International, 1945. Pp. 423.

FLÜGEL, J. C. Man, Morals, and Society. New York: International, 1945. Pp. 328.

RAPAPORT, D. Diagnostic Psychological Testing. (2 vols.) Chicago: Yearbook, 1945. Pp. 573 & 516.

WERTHEIMER, M. Productive Thinking. New York: Harper, 1945. Pp. 224.

LEWIS, N. D. C., & PACELLA, B. L. Modern Trends in Child Psychiatry. New York: International, 1945. Pp. 341.

(1946)

HARRIMAN, P. L., *Ed.* Twentieth Century Psychology. New York: Philosophical Library, 1946. Pp. 712.

MASSERMAN, J. H. Principles of Dynamic Psychiatry. Philadelphia: Saunders, 1946. Pp. 322.

SEWARD, G. H. Sex and the Social Order. New York: McGraw-Hill, 1946. Pp. 301.

SMITH, B. L., LASSWELL, H. D., & CASEY, R. D. Propaganda, Communication, and Public Opinion. Princeton: Princeton Univ. Press, 1946. Pp. 435.

MORENO, J. L. Psychodrama. New York: Beacon House, 1946. Pp. 429.

SYMONDS, P. M. The Dynamics of Human Adjustment. New York: Appleton, Century, 1946. Pp. 666.

HARRIMAN, P. L. Encyclopedia of Psychology. New York: Philosophical Library, 1946. Pp. 897.

GESELL, A., & ILG, F. L. The Child from Five to Ten. New York: Harper, 1946. Pp. 475.

GESELL, A. The Embryology of Behavior. New York: Harper, 1946. Pp. 289.

DUNLAP, K. Personal Adjustment. New York: McGraw-Hill, 1946. Pp. 446.

DUNLAP, K. Religion: Its Functions in Human Life. New York: McGraw-Hill, 1946. Pp. 362.

RICHARDS, T. W. Modern Clinical Psychology. New York: McGraw-Hill, 1946. Pp. 331.

CRITICAL REVIEWS OF RECENT BOOKS

The Journal of Genetic Psychology, 1946, 69, 223-230.

(Rapaport, D. Diagnostic Psychological Testing. (2 vols.) Chicago: Yearbook, 1945. Pp. 573 & 516.)

REVIEWED BY C. H. PATTERSON

These two volumes are an essential for all clinical psychologists. They represent the most extensive and exhaustive study yet reported of diagnosing by means of psychological tests. Some of the material was published earlier as a *Manual of Diagnostic Psychological Testing* by the Josiah Macy Foundation, for distribution to psychiatrists and psychologists in the Armed Forces, where it proved useful in the clinical psychology programs. The present volumes amplify and provide the statistical justification for the qualitative results reported earlier.

The aims of the investigation are stated as follows in the introduction:

> (1) We have attempted to show how the . . . tests which are the subject of the investigation reported here were welded in our clinical work into a single diagnostic tool. (2) We have attempted to validate those of the tests which have already been put to general clinical psychological use, but for which no systematic clinical validation has been offered in the past. . . . (3) We have attempted to put to general use some of these tests which were hitherto used only in the study of specific groups of cases . . . by designing and validating new scoring and interpretation criteria. (4) We have attempted to develop a psychological rationale for each of these tests and for the different types of responses on them (Vol. I, pp. 4-5).

The subjects utilized in the research included 217 clinical cases and 54 control cases. The clinical subjects were divided into 20 different diagnostic categories, the number of cases in each ranging from 6 to 20. The various psychoses and neuroses are all included, with a few exceptions, such as hebephrenic schizophrenics and manics, and in addition there are groups of preschizophrenics. Children, organic cases, psychopathic personality and addiction cases, and "those atypical cases which in terms of clinical findings did not lend themselves to nosological classification" (Vol. I, pp. 12-13) were excluded. The diagnoses were revised "wherever vagueness of nosological concepts as reflected in the initial diagnosis would have put clinically similar cases into different categories. . . . We wished to make sure that no other major factor, besides that referred to in the nosological categorization, was present in the case to cloud even the hope of getting a consistency of test results. . . . It was necessary that the psychiatrist and the clinical psychologist coöperate in setting up nosological categories which had meaning in terms of the diagnostic potentialities of the tests" (Vol. I, p. 17). All cases of doubtful or questionable diagnosis, or cases with more than one major feature, were eliminated. Thus the smallness of the groups were compensated for by their selection, leading to differences great enough to reach statistical significance.

The control group consisted of members of the Kansas State Highway Patrol. These were divided according to degree of adjustment, and according to whether or not they showed evidences of anxiety, depression, schizoid personality and inhibition, so that the influence of these factors on the tests might be investigated in the normal range. Unfortunately, the control group is not comparable to the clinical groups in terms of socio-economic or cultural factors. Rapaport recognizes that the use of this group will meet with criticism (Vol. I, p. vi), but attempts to justify it by questioning the meaning and possibility of obtaining a matched control group, asking what variables should be used for matching the groups. He concludes that "our best procedure seemed to be to take a homogeneous group of more or less well-functioning subjects, and explore what they are like clinically (Vol. I, p. vi). However, this appears to have been the result of necessity rather than choice, and obscures the interpretation of many of the results, particularly on those tests which are influenced by social and cultural factors (e.g., the concept formation tests).

The battery of tests administered to these subjects included the following, in the order in which they are discussed in the report: (1) the Wechsler-Bellevue Scale; (2) the Babcock Deterioration Test (short form); (3) the Sorting Test (Goldstein-Sheerer); (4) the Hanfmann-Kasanin Test, often referred to as the Vigotsky or Ach-Sacharov Test; (5) the Word Association Test; (6) the Rorschach; (7) the Thematic Apperception Test. An eighth test, the Szondi Test, was included in the study, but it is not discussed in this report. These tests were selected to supplement each other, and to cover various aspects and levels of functioning. Subjects were tested without the psychologist's being aware of the symptoms, history, or other significant data. Not all of the subjects were given all of the tests; e.g., only 151 were given the Word Association Test.

The discussion of each test includes a description of the test, the psychological rationale of the functions involved in the test and subtests if any, a description of its administration which supplements without duplicating the regular manual of instructions, and the qualitative and statistical results. Appendices contain brief reviews of the literature on each test, descriptive data on each case, and the individual scores and group averages for each test upon which quantitative scores were obtained. Also included in an appendix are the Rorschach scorings for each subject.

Statistical methods of analysis include Chi square and "*t*," together with "*p*," corrected for small samples. Graphs are freely used to supplement tables, and to present the statistics given in the tables in graphical form. Group averages and distributions are compared, and in the case of the Babcock test the deviations of group deterioration means from zero are computed and compared.

A summary of the specific results of the investigation is impracticable, since these results are legion. The volumes are loaded with statistical tables, graphs, detailed analyses and comparisons. Continuous reading of such material is difficult; it should best be used as a reference in connection with clinical work with particular tests and cases. Conclusions are explicitly stated after each particular analysis. Summarization is frequent within the discussion of a test, as well as at the conclusion of the analysis of each test, the latter being a bringing together of the results under diagnostic entities. These chapter summaries suffer, however, from an inadequate discussion of differential diagnosis. In some cases the main diagnosis is assumed, and a differentiation between acuteness, chronicity, and deteriorated types is discussed. But if it is not known, for example, that a patient is an unclassified schizophrenic rather than a paranoid schizophrenic, it might be impossible to determine whether he is an acute unclassified or a deteriorated paranoid schiz, since both may be characterized by an essentially similar test performance.

A final chapter of 6½ pages discusses too briefly the problem of diagnosing with a battery of tests, but although there are cross references throughout the work indicating the supplementary value of various tests, there is no bringing together of the results of all of the tests in sufficient detail. An organized tabular summary of results, by test and by diagnostic grouping, would be of great value to the clinician. Also, case studies of subjects representing the various nosological categories to whom the entire battery of tests had been given would be valuable to illustrate how the tests supplement and complement each other in differential diagnosis.

Following the Introduction and a brief chapter on "The Nature of Intelligence" is the chapter dealing with the Wechsler-Bellevue Scale, the longest chapter in the work (347 pages). The analysis of this test is based primarily upon a study of various measures of scatter. Many of these measures are very similar; for example, mean scatter (the difference between a subtest score and the average of all verbal or performance tests) and modified mean scatter (the difference between the subtest score and the average of all *other* verbal or performance tests). The use of the latter only accentuates the difference and its significance. Complete analysis of both these measures is therefore superfluous.

Although as pointed out by the authors, scatter is independent (or relatively independent) of *IQ*, this is not true of other diagnostic measures which are absolute rather than relative. One such measure which is used in the analysis of the Bellevue Scale is the percentage of cases in each group with high and low scores on a subtest. In the discussion of differences in these percentages among the diagnostic groupings, no attention is given to the influence of total score or *IQ* levels of the groups, which vary from 91 to 119, a difference which is certainly significant. (The reviewer has estimated, though not computed the degree of significance; although individual and mean *IQ*'s are given, no standard deviations are listed in the table in the index). Although *IQ* bears some relationship to nosological groupings, this relationship is small, and it is unlikely that such small samples as used in this study would all be representative groupings in *IQ*.

Following this chapter on the Bellevue Scale the Babcock test is discussed. On the basis of the analysis of the results of this test, the authors further reduce the nine tests of the short form to seven tests, omitting Sentence Repetition from the Repetition group, and Paired Associates from the Learning group. The Symbol Digit test is not included in the Learning group, but is retained in the Motor group.

The section on tests of concept formation includes an introductory chapter, a short discussion of the Similarities subtest of the Bellevue Scale, a longer chapter on the Sorting Test, and a short chapter on the Hanfman-Kasanin test. A concluding chapter integrates these three tests of concept formation. The Hanfmann-Kasanin test by its nature is not susceptible to statistical analysis, and is therefore treated qualitatively.

Volume II opens with an introductory chapter discussing projective procedures, followed by the discussion of the Word Association Test. This is not the familiar Kent-Rosanoff, nor the Jung-Eder test, but one compiled by Dr. William Orbison, consisting of 60 words. All of the words are emotional in content, referring to such areas as home, aggression, oral, and anal and sexual. Analysis is in terms of reaction time, popular reactions, formal characteristics of the reactions, and content. Diagnosis is in terms of number and type of association disturbances.

The Rorschach chapter which follows is the second longest in the investigation (309 pp.). The original technique and scoring of Rorschach rather than the modifications of Beck or Klopfer were used as the basis in this study. This was done in order to simplify and shorten the administration of the test and the handling of the data. The test was administered with the *S* facing the examiner, not in front or beside the examiner, facing in the same direction. Testing was begun without the usual explanations, though after the first card brief instructions were given. The inquiry was conducted after each card, without the card being seen by the subject insofar as this was possible, and was supposedly brief and limited. Rapaport maintains that with the experienced examiner extensive inquiry is not necessary. However, it appears to the reviewer that the assuming of the area or determinant by the examiner is dangerous, since it is surprising, particularly with clinical patients, how frequently a response refers to an unusual area, or involves an unusual or unsuspected determinant. Rapaport is of course aware of this, and as a matter of fact appears to conduct as thorough an inquiry as anyone else. Also, the introduction of other refinements in scoring, such as two four-fold classifications of *F* responses, introduces the need for inquiry frequently. It would appear that Rapaport's system of scoring is actually no simpler than that of Beck, or of Klopfer. The main saving in time seems to be in Rapaport's rejection of the practice of testing the limits.

The Rorschach chapter includes a discussion of the scoring cataegories, including criteria for scoring, as well as considerable treatment of the interpretation and significance of each score. In addition to the usual scoring categories, an analysis of deviant verbalizations, including confabulations, contaminations, autistic logic, symbolism, confusion and incoherence, absurdities, etc., is presented. Rapaport finds that the average number of responses in both his control and clinical groups is less than that reported in other studies; this is probably due, at least in part, to the manner of administration and scoring (including what constitutes a response) which he uses. This chapter is concluded by a brief four- or five-line summary of the diagnostically significant elements in each case tested, rather than by the usual summary by diagnostic groups.

The Thematic Apperception Test is interpreted in terms of the formal characteristics of the story structure (compliance with instructions, and intra- and inter-individual consistency), and the formal characteristics of the story content (the prevailing "tone," the figures of the story, strivings and attitudes, and obstacles and barriers). Although the statistical analysis of the data on this test was not carried out in time for publication, qualitative diagnostic indications are considered.

Volume I suffers from an overloading of tables and graphs. This is true particularly of the section on the Wechsler-Bellevue. It is a result of what the authors admit is an overemphasis of statistical procedures on this test. The tables and graphs could be improved for easier reading. The data would be more quickly apprehended if some means of making the more significant figures stand out, such as the use of darker or larger print, italics, or underlining, were used. Many minor criticisms could be made, such as asking.why instead of a statement such as "apparently these cases with high efficiency on Comprehension have other verbal scores which are considerably impaired" (Vol. I, p. 126), the facts were not checked, since only three subjects were involved. There are occasional minor disagreements in figures between tables, or between a table and the text. These may be typographical errors, however, several of which occur throughout the volumes.

These minor defects are hardly worth mentioning in a work which contributes so much to the field of clinical psychology, both to the basic problem of diagnostic testing—the formulation of the rationale of the tests and the interpretation of results in terms of clinical behavior—and to the practical aspects of clinical work, in its practical, empirical results.

The analysis of the data, and the organization and interpretation of the results, represent a tremendous amount of time and effort, to say nothing of the years required to collect the data. The study is by no means complete, as recognized by the authors themselves. The authors are also aware of its defects—the small number of cases, the nature of the control group, the lack of other diagnostic groups such as organics, psychopaths, etc., and the incompleteness of the statistical analysis on certain tests. The main defect which might have been remedied is the lack of a sufficiently detailed integrating summary of the findings for all tests for the various diagnostic groups as an aid in differential diagnosis.

The study does reveal that there are significant differences between normals and abnormals, and between various nosological groups in their performance on a battery of psychological tests. Not all tests differentiate each group from all the other groups. There is no easy method of differentiation. Even in this study of carefully selected, relatively clear or "pure" diagnostic groups, there are many similarities and overlappings. This perhaps should be expected—abnormal processes perhaps have certain common results, or attack certain common functions, in all patients, whatever the diagnosis.

And on the other hand, individual differences in prepsychotic and preneurotic abilities and personalities no doubt influence the nature of the abnormal process, resulting in considerable variation in similar nosological groups. Nevertheless, group differences do appear, and relative impairments of functions are logical in terms of the clinical observation of the various groups.

The results are clear enough so that an experienced clinician by the use of one or more of these tests can correctly diagnose a relatively clear case. However, the crucial test of diagnostic psychological testing comes in being able to diagnose the perplexing, "impure," borderline cases, at least to the extent of directing the observation of the psychiatrist, or to confirm or deny his tentative diagnosis, and lead him to a diagnosis which he recognizes as consistent with the patient's history and behavior. It is in just these cases that the psychiatrist needs assistance; he does not need test results to diagnose a classical type of disorder. The ability of a test to diagnose clear cases is not helpful to the psychiatrist, and is not likely to lead to recognition by psychiatry of the value of psychological tests.

Investigations such as that represented in the volumes being reviewed, however, dealing with the relatively clear case, are basic. It is from knowledge of the characteristics of the test performance of these cases that the unclear signs and trends in more difficult cases can be interpreted. It goes without saying that in the group from which the cases used in this study were selected many difficult cases were met in which the practical use of the tests was undoubtedly important.

Psychological diagnosis is thus not a cut and dried, mechanical, quantitative process, performed by the use of statistical tables. Nor is it a purely intuitive one. It becomes a process of weighing and comparing the qualitative and quantitative performances of the patient in the light of findings such as those provided by this study, and reaching a final judgment which is the synthesis of a complex analysis of data. Skill can come only from experience with the tests, and from clinical knowledge of and experience with the various nosological categories, not from study and reading alone. The multitude of findings in an investigation such as this is too great to be committed to memory. The number of factors to be considered in diagnosing a single case is large. Except in rare cases (that is, where routine testing of all patients is not followed), a diagnosis cannot be made immediately following the administration of the test, but may require considerable analysis and thought. Psychological testing for purposes of diagnosis is thus not the routine process of testing for an *IQ* or other test score, where several tests can be administered and scored in a day.

These volumes are a monumental work in the field of diagnostic psychological testing. "Clinical psychologists are often under the misconception that to do a better job they need more testing tools; but what needs improvement is the training of the clinical psychologists and the exploration of testing tools now at their disposal" (Vol. II, p. 89). This latter area of need is considerably advanced by the present investigation. As indicated at the beginning of this review, no clinical psychologist can afford to be without these volumes.

Veterans Hospital
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BOOKS RECENTLY RECEIVED

(There will always be two pages of book titles, listed in the order of receipt, i.e., the most recently received books will be found at the end of the list.)

Freud, A., *et al.* (*Editors.*) The Psychoanalytic Study of the Child. (An annual, Vol. 1.) New York: International, 1945. Pp. 423.
Simmons, L. W. The Rôle of the Aged in Primitive Society. New Haven: Yale Univ. Press, 1945. Pp. 317.
Morgan, H. K. Industrial Training and Testing. New York: McGraw-Hill, 1945. Pp. 225.
Bernhardt, K. S. Practical Psychology. New York: McGraw-Hill, 1945. Pp. 319.
Crow, L. D., & Crow, A. Our Teen-Age Boys and Girls. New York: McGraw-Hill, 1945. Pp. 366.
Baumgarten, F. Die Psychologie im Kaufmännischen Berufe. Zürich: Organisator, 1945. Pp. 159.
Abrahamsen, D. Men, Mind, and Power. New York: Columbia Univ. Press, 1945. Pp. 155.
Raven, J. C. Controlled Projection: A Standard Experimental Procedure. London: Lewis, 1944. Pp. (not numbered). (Distributed in the United States by The Psychological Corporation.)
Duvall, E. M., & Hill, R. When You Marry. Boston: Heath, 1945. Pp. 450.
Rockwood, L. D., & Ford, M. E. Youth, Marriage, and Parenthood. New York: Wiley, 1945. Pp. 298.
Harrington, M. The Management of the Mind. New York: Philosophical Library, 1945. Pp. 200.
Herr, V. V. How We Influence One Another. Milwaukee: Bruce, 1945. Pp. 266.
Brandt, H. F. The Psychology of Seeing. New York: Philosophical Library, 1945. Pp. 240.
Heath, C. W., *et al.* What People Are. Cambridge: Harvard Univ. Press, 1945. Pp. 141.
Beaumont, H. The Psychology of Personnel. New York: Longmans, Green, 1945 Pp. 306.
Lowy, S. New Directions in Psychology. New York: Emerson, 1945. Pp. 194.
Farrow, E. P. Psychoanalyze Yourself. New York: International, 1945, Pp. 157.
Gonzalo, J. Dinamica Cerebral. Madrid: Institute Cajal, 1945. Pp. 392.
Householder, A. S., & Landahl, H. D. Mathematical Biophysics of the Central Nervous System. Bloomington: Principia, 1945. Pp. 124.
Lewis, N. D. C., & Pacella, B. L., *Eds.* Modern Trends in Child Psychiatry. New York: International, 1945. Pp. 341.
Lecky, P. Self-Consistency. New York: Island Press, 1945. Pp. 154.
Wertheimer, M. Productive Thinking. New York: Harper, 1945. Pp. 224.
Blackburn, J. Psychology and the Social Pattern. New York: Oxford Univ. Press, 1945. Pp. 157.
Todd, L. P. Wartime relations of the Federal Government and the Public Schools, 1917-1918. New York: Columbia University, 1945. Pp. 240.
Wolberg, L. R. Hypnoanalysis. New York: Grune & Stratton, 1945. Pp. 342.
Masserman, J. H. Principles of Dynamic Psychiatry. Philadelphia: Saunders, 1946. Pp. 322.
Rapaport, D. Diagnostic Psychological Testing. (2 vols.) Chicago: Year Book, 1945. Pp. 573 & 516.
Harriman, P. L., Ed. Twentieth Century Psychology. New York: Philosophical Library, 1946. Pp. 712.
MacGregor, G. Warriors without Weapons. Chicago: Univ. Chicago Press, 1946. Pp. 228.
Parkes, J. Antisemitism. New York: Penguin, 1946. Pp. 160.
Mellett, L. Handbook of Politics. New York: Penguin, 1946. Pp. 144.

Faculty of University School. How Children Develop. Columbus: Ohio State Univ., 1946. Pp. 79.

White, J. G. Changing Your Work. New York: Association, 1946. Pp. 210.

Westover, F. L. Controlled Eye Movements versus Practice Exercises in Reading. New York: Teach. Coll. Columbia Univ., 1946. Pp. 99.

Sargent, W. E. Teach Yourself Psychology. London: McKay, 1946. Pp. 159.

Gerth, H. H., & Mills, C. W. From Max Weber. New York: Oxford Univ. Press, 1946. Pp. 490.

Walsh, J. F. Facing Your Social Situation. Milwaukee: Bruce, 1946. Pp. 237.

Bergler, E. Unhappy Marriage and Divorce. New York: International, 1946. Pp. 167.

Morgan, J. J. B. How to Keep a Sound Mind. New York: Macmillan, 1946. Pp. 404.

Save, K. J. The Warlis. Bombay: Padma, 1946. Pp. 280.

Walker, K. The Physiology of Sex. New York: Penguin, 1946. Pp. 183.

Moreno, J. L., *Ed.* Group Psychotherapy. New York: Beacon, 1946. Pp. 305.

Castiglioni, A. Adventures of the Mind. New York: Knopf, 1946. Pp. 428.

Munn, N. L. Psychology. New York: Houghton Mifflin, 1946. Pp. 497.

Guthrie, E. R., & Horton, G. P. Cats in a Puzzle Box. New York: Rinehart, 1946. Pp. 67.

Seward, G. H. Sex and the Social Order. New York: McGraw-Hill, 1946. Pp. 301.

Smith, B. L., Lasswell, H. D., & Casey, R. D. Propaganda, Communication, and Public Opinion. Princeton: Princeton Univ. Press, 1946. Pp. 435.

Johnson, W. People in Quandaries. New York: Harper, 1946. Pp. 532.

Maier, N. R. F. Psychology in Industry. Boston: Houghton Mifflin, 1946. Pp. 463.

Carmichael, L., *Ed.* Manual of Child Psychology. New York: Wiley, 1946. Pp. 1068.

Edwards, A. L. Statistical Analysis. New York: Rinehart, 1946. Pp. 360.

Link, H. C., & Hopf, H. A. People and Books. New York: Book Man. Inst., 1946. Pp. 166.

Teagarden, F. M. Child Psychology for Professional Workers. New York: Prentice-Hall, 1946. Pp. 613.

Orgel, S. Z. Psychiatry Today and Tomorrow. New York: International Univ. Press, 1946. Pp. 514.

Lorand, S. Techniques of Psychoanalytic Therapy. New York: International Universities Press, 1946. Pp. 251.

Moreno, J. L. Psychodrama. New York: Beacon House, 1946. Pp. 429.

Beaumont, H. Psychology Applied to Personnel. New York: Longmans, Green, 1946. Pp. 167.

Symonds, P. M. The Dynamics of Human Adjustment. New York: Appleton, Century, 1946. Pp. 666.

Genetic Psychology Monographs *(continued)*

VOLUME 21—January-December, 1939
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